

# IMPLEMENTATION OF THE RECLAMATION REFORM ACT OF 1982 IN THE CENTRAL VALLEY PROJECT

## Draft Environmental Impact Statement

United States Department of the Interior  
Bureau of Reclamation  
Denver Federal Center, Building 67  
Denver, Colorado 80225

March 1993

Appendices K - Q  
Volume III of III



**Appendix O**  
**Technical Memorandum Task 10,**  
**Recreation**

**Technical Memorandum**

**for**

**Task 10 - Recreation**

**FEBRUARY 1993**

**for the**

**United States Bureau of Reclamation**

**Delivery Order No. 2-PD-2D-0152 A/003**

**Against Contract No. 2-CA-20-152A  
(Contract Administration)**

**by**

**ENVIRONMENTAL SCIENCE ASSOCIATES, INC.**

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# **RECREATION**

## **1.0 STATEMENT OF PURPOSE AND RESEARCH QUESTIONS**

### **1.1 PURPOSE**

The recreation investigation analyzes the possible changes related to the U.S. Bureau of Reclamation's (Reclamation) implementation of the 1987 "Hammer Clause" and 1988 regulations of the Reclamation Reform Act (RRA) on Central Valley Project (CVP) recreation sites within the six CVP-served sample water and irrigation districts. The study also analyzes change in two non-CVP-served control districts. Two time periods will be described in the setting and change discussions: Pre-Hammer Clause (prior to 1987) and Post-Hammer Clause Implementation (1987 and later).

The objective of the analysis will be to identify possible linkages between the Reclamation's regulations for implementation of the RRA and trends in recreation visitation. A direct linkage of the regulations of 1987 and 1988 to recreation is not anticipated because neither the RRA nor the implementing regulations specifically addressed uses of water for beneficial recreation purposes. The assumption used for the assessment is that the changes in recreation use could only be indirectly related to the RRA regulations through changes in the physical landscape (hydrology, water-quality, crop patterns), and in demography, if these were changed by the RRA regulations. If no or insignificant changes for these issues are attributed to the action, then the recreation changes also are not likely to have occurred in response to implementation of the 1987 and 1988 regulations.

### **1.2 RESEARCH QUESTIONS**

Because of limitations in time available to collect data, trends in recreation and their analysis are focused on water-oriented recreation at the source reservoirs located in or near the sample agencies and at nearby wildlife refuges. It is hypothesized that the water supply, if affected by the 1987 and 1988 regulations, would provide a physical linkage to water-oriented recreation by affecting the amount and quality of the water resource that attracts visitation. It is further hypothesized that, if the regulations affected population, then they may have affected local demand for recreation.

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The following research questions summarize five possible linkages between implementation of the RRA and water-oriented recreation:

Research Question No. 1: Wildlife Preserves: If increases in shallow ground water extraction related to the increased cost of CVP water to some farms negatively affected surface water supplies, particularly to refuges, then wildlife values may have been reduced, and in turn, was recreation visitation at the preserves reduced?

Research Question No. 2: CVP Source Reservoirs: If water was freed-up by conservation programs and was retained longer in the source reservoirs (e.g., Millerton Lake, San Luis Reservoir, and O'Neill Forebay), then a more stable water level in CVP source reservoirs and a slower decrease in water levels throughout the year may have occurred (although it is recognized that these increments likely would be negligible in even normal precipitation years). Did this, in turn, create a more attractive water resource for recreation, thereby increasing recreation visitation?

Research Question No. 3: CVP Rivers/Canals: As in Research Question No. 2, if water were held longer in CVP canals and distribution channels yielding more stable water flows throughout the year, did beneficial effects on recreation use, such as increased fishing occur?

Research Question No. 4: Rivers/Canals: If less runoff was "wasted" to rivers, and water conservation resulted in less agricultural drainage water directed into rivers, did decreased recreation opportunity occur on those rivers?

Research Question No. 5: Local Demand: If the subdivision of farms resulted in an increased local population, did recreation demand increase and, in turn, add to visitation at local recreation sites?

Results presented in the cropping pattern, hydrologic, and ground water/drainage, and social change investigations technical memoranda indicate that there were no significant changes in agricultural, hydrologic, ground water, or population conditions resulting from Reclamation's implementation of the 1987 and 1988 regulations. Therefore, the physical basis for a possible linkage to recreation and the demographic impetus for higher recreation demand are not supported by the findings.



## **2.0 METHODOLOGY**

The recreation section describes only existing formal recreation facilities directly using CVP waters in six CVP-served Sample Agencies (SA). These sites include reservoirs and canals on the CVP, U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) wildlife refuges with recreational facilities receiving Reclamation water. Recreation sites owned by Reclamation in or near the SAs were selected because of: 1) their inherent water-dependency, 2) their dependency on waters controlled through the CVP distribution system, and 3) their record of internally consistent visitor use data over at least about a 10-year period. No other recreation sites within the SAs will be described. Two national wildlife refuges in the control districts will be described.

This study does not consider visitation change at informal recreation sites because no data are available for them. At developed reservoirs, lake, river/canal sites, visitation can be measured directly due to the controlled access and entry points. Informal water-related recreation sites are frequently located along rivers or canals with no single point entrance. Visitation levels at informal sites, therefore, if they are available at all, are usually derived by differing survey methods, and typically are "snapshot" counts directed to a specific purpose. No data sets of this type covering the study period were available upon which a change assessment could be constructed.

The recreation analysis emphasizes the potential effect of implementation of the 1987 and 1988 RRA regulations on water-related recreation sites and water-related or water-dependent recreation activities, such as, rafting/tubing, canoeing, power boating, houseboating, swimming, angling, boating, water-skiing, and bird watching at the preserves. The analysis also describes recreation use levels and trends for sites involving the use of CVP waters for the two setting periods and discusses possible linkages between the trends in recreation visitation and implementation of the RRA.

### **2.1 ESTIMATION OF WATER-ORIENTED RECREATION DEMAND**

This report describes existing and past recreation demand levels using estimates or actual counts of total number of visitors or visitor hours. Actual use levels are used to describe existing recreation conditions over the two periods of analysis. Three sets of data are used in this analysis: use levels, in visitor days, as reported by facility

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managers to Reclamation (for the CVP sites); use levels, in total number of visitors, as reported to CDFG by preserve managers (for the State preserves); and use levels, as surveyed, for the USFWS (for the National Wildlife Refuges).

Each of the three data sets will be used to evaluate one or several of the research questions presented above. The CDFG and USFWS data sets will be used to test question No. 1 listed above. Reclamation data for CVP sites will be used to test question Nos. 2, 3, and 4. All data sets will assist in testing question No. 5 pertaining to possible change in local populations resulting from farm subdivision.

Demand can also be estimated in terms of population change (often as a function of the net growth in population). Change in background population of the two control districts and the six sample CVP-served districts is discussed in the Task 11 Technical Memorandum, Social Impacts. The trends in recreation visitation reported here are not adjusted to account for population growth during the study periods. Therefore, in addition to other possible causes, the changes in total visitation may reflect changes in the background population.

In addition to population numbers, the demographic characteristics of the Central Valley also changed significantly during the 1980's. Changes in socioeconomic factors could contribute to changes in recreational use patterns. For example, the minority population increased from 33 percent in 1980 to 43 percent in 1990, primarily due to changes in the Hispanic and Asian population. However, there are no recreation demand data specifically addressing socioeconomic variables in the Central Valley Project area. This is a significant void in the historical recreational user data.

An increase in visitation rates can be an expression of latent demand. In 1987, the California Department of Parks and Recreation (CDPR) published a survey of outdoor recreation in the state. Out of 38 activities studied, nine received a high rating for latent demand, that is, demand for recreation opportunities which remains currently unmet. The nine activities included five that are common at the water-dependent sites investigated in this study: 1) beach activities; 2) bird watching, 3) general nature study, and visiting natural areas; 4) freshwater fishing; and 5) camping and picnicking in developed sites. It was postulated that an increase in recreation opportunities for these water-dependent and water-related activities related to implementation of the RRA (research question Nos. 2 and 3) and potentially could have increased visitation, as

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latent demand was met by potentially more attractive water resources at existing sites. There is no evidence, however, that the 1987 and 1988 RRA regulations in any way stimulated or contributed to development of new facilities, such as new campsites, nor would such a connection be anticipated.

Demand can be expressed in terms of changing preferences for different activities. Employment and disposable income sometimes have been used to estimate recreation demand. The Task 9 Technical Memorandum describes economic indicators, such as farm income, that can affect recreation demand and consumption patterns.

Physical characteristics of the water resource, especially average water flow and variability of water flow, usable surface area, water quality, and water temperature can affect visitation levels at a particular site and substitution among water-based recreation sites (QED Research, Inc., 1988).

Water based recreation demand frequently displays a seasonal component. Waterfowl common in the Central Valley refuges are especially numerous from about October through January, while other bird species may be viewed in the spring and summer, or year round. Bird-watching and hunting activities associated with these animal species will then also display a seasonal pattern. The season and duration of hunting is strictly controlled by licensing and regulations. Swimming, rafting/tubing, wading, fishing, boating, and picnicking are all common river and reservoir activities in the summer. During other months of the year, especially as the air and water temperature drop, fishing may become the primary activity as other activities drop off. The relationship of visitation rates to river water flows or reservoir levels at the low-temperature time periods may be very indirect because this period also coincides with the period of reduced vacation activity and travel, factors which probably exert strong influence over recreation visitation.

### 2.2 LIMITATIONS OF AVAILABLE DATA

Information (concerning recreation in the SAs) was compiled by conducting extensive literature review, as well as consulting knowledgeable representatives of Reclamation, CDFG, USFWS, U.S. National Forest Service, U.S. National Park Service, CDPR, U.S. Bureau of Land Management, and local jurisdictions. Because the study required examination of eight SAs which extend discontinuously through the Central Valley from

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Glenn County to Tulare County, over a time period of at least 10 years, substantial constraints were placed on locating readily available, pertinent, usable recreation data. Studies containing information on recreation in the Central Valley and in the specific SAs were found to be lacking. Available information generally either focuses on one particular facility or jurisdiction over a relatively short period of time, or is presented inconsistently, either in terms of spatial coverage or applied survey methodology, over the setting periods needed. Use of such studies would likely provide misleading results because they would not permit the viable comparison of SAs.

A major limitation of the available data sets is that the extent of water dependency of the visitation rates cannot be quantitatively assessed. In the case of the CVP data, only the top three activities with most participation, as defined by the facility manager, are identified; no quantitative rankings are available. The CDFG data from the state preserves are also not specifically broken down to show water-dependent user levels separately. Because the sites were selected for their water-dependency, visitation levels are assumed to be indicative of participation in water-dependent activities; however, the quantitative extent of that association is unknown, and "noise" will be introduced by the inclusion of activities that are not directly dependent upon water, such as picnicking and small game hunting.

In 1981, Reclamation began using the 12-hour visitor day as the standard for compiling annual visitor days. Reclamation derives visitor day levels from auto surveys at the facilities (Petrinovitch, 1992). Annual visitor days is a measurement of use at the facility. Recreation trends for the State and National preserves are reported in total number of visitors per year. The figure is not directly comparable with Reclamation's total visitor days, but is useful in comparing general trends in use. Because three data sets are used (each with different indicators of recreation demand), comparisons of trends among sites with different measures of demand must be qualitative and general in nature.

The recreation use data cannot be tied to user origin. This significantly limits the interpretation of data and the findings because the study is based on the assumption that impacts of the 1987 and 1988 RRA regulations are local in nature and identifiable at the SAs and environs. Information on the use of Central Valley recreation areas by tourists also would be needed to understand the trends recreational visitation. Tourists from outside California and the United States also visit these recreation areas. The

extent of their use of Central Valley recreation would be useful in determining the causes for various changes in recreational visitation. Currently there are no data available which quantify the number of out-of state tourists who visit the Central Valley recreation areas. Recreation sites and facilities can draw visitors from a wide region depending upon the nature of the facility and the time of year. For example, large reservoirs with developed facilities for camping and boating draw summertime visitors from Los Angeles, the San Francisco Bay Area, and elsewhere. In addition, user levels at sites, especially for some facilities in the wildlife preserves, are based on records from unstaffed self-registration areas. In these cases, the number of users is likely only a portion of the actual number who visited, and the validity of the data is in question. However, this does not mean that the data are without value. To the contrary, the data can probably be regarded as valid for depicting *overall* trends, which are the subject of this study.

### **3.0 GENERAL SETTING AND EXISTING CONDITIONS**

Leisure time and recreational activities contribute significantly to personal well-being and quality of life. Increasing proportions of the national income are being devoted to the planning and spending of leisure and recreational time, and to the provision of related facilities and services. More than 80 percent of Californians participate in some sort of outdoor recreation activity (Reclamation, 1992). Almost 60 percent of Californians consider themselves to be "outdoor" persons, and almost 70 percent consider parks and recreation areas to be important to their lifestyle (CDPR, 1988). In 1987, Californians spent more than one billion household participation days on outdoor recreation activities (CDPR, 1987).

The 1987 CDPR survey of 38 outdoor recreation activities, included nine water-oriented activities and two "backcountry and natural activities" that are the subject of this study. Water-related recreation is an important part of the overall recreation participation in California. More than 20 percent of all household participation days in 1986 were for activities directly related to water and beach use (CDPR, 1988). Activities that were simple in terms of required equipment and skill-level, and inexpensive tended to have the higher participation rates. The study found that the top five water-oriented activities in terms of millions of participation days (mpd) in 1986 were: beach activities, including sunning and games (69.0 mpd); swimming in lakes, rivers, and the ocean (42.6 mpd);

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bird watching, general nature study, visiting natural areas (31.5 mpd); freshwater fishing (19.5 mpd), and power boating (9.7 mpd).

Recreational areas and activities can be classified as either indoor or outdoor, designated or informal, and active or passive. Parks, recreational facilities, trails, golf courses, campgrounds, and wilderness and water areas provide a variety of settings for recreational activities in the eight sample agencies. Certain recreational activities, such as swimming, boating, and fishing are dependent on water resources, whereas other activities, such as hiking, sightseeing, and passive nature appreciation, are enhanced by water features. Typically, a recreation site that is primarily water-oriented will provide a mix of activities, both water-dependent and non-water-dependent.

This analysis focuses on CVP water-based, or CVP water-dependent, designated recreational opportunities. Water-based recreation is an important source of economic activity to local and regional economies. The reliability of water supply is essential to meeting the demands for recreation at reservoirs and lakes, wildlife preserves, and rivers and canals in California.

Because recreational travel patterns in California indicate that considerable inter-regional travel occurs in pursuit of water-based recreation opportunities, recreation areas located throughout the State may provide substitute opportunities for each other within a region (Reclamation, 1988). The recreation user's selection of a particular recreation area depends on the access costs and attributes of that area, as well as the costs and attributes of all recreation areas that serve as alternatives. Site attributes include the size of the recreation area, the quality of the resources, accessibility, facilities available, fish and wildlife resources, and aesthetic qualities (Reclamation, 1988).

Recreation areas accessible by roads are generally in greater demand than sites requiring several miles of hiking for access. Developed facilities may contribute to site attractiveness and increase user capacity for most activities. Important facilities for water-dependent recreational activities include boat ramps, marina slips, parking spaces, campsites, picnic sites, and trails (Reclamation, 1988).

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Hunting and fishing are totally dependent on wildlife and fish resources. Other activities (e.g., sightseeing) are enhanced by them. Wildlife and fish resources and species diversity are expected to enhance recreation demand, especially at the refuges.

Recreation opportunity is an important benefit of the CVP facilities. There are 36 developed recreation areas, which combined drew over 16 million visitors of use in 1991. Through the Federal Water Project Recreation Act, Reclamation has become involved in the development of both recreation facilities and fish and wildlife enhancement programs. Recreation activities at all Reclamation sites are primarily water-oriented. The management of Reclamation recreation facilities is customarily handled under a memorandum of understanding with other federal agencies, and by agreement, lease, or license with state and local governmental agencies (CDPR, 1988). Recreation sites using or affected by CVP water within the eight SAs may be classified into three categories: (a) wildlife refuges and preserves; (b) reservoirs; and, (c) rivers and canals. These categories are useful in describing differences and similarities among sample agency area recreation sites in terms of stream flow / water level, operating entity / jurisdictional authority, and recreational activity(ies) supplied.

Table 10-1 lists and summarizes characteristics of the Federal and state wildlife areas, with recreation activities, using or affected by CVP water that occur in or near a SA. Table 10-2 lists Reclamation-owned recreation sites using or affected by CVP water within or near the SAs. Table 10-3 also lists the agency that manages recreation activities at the site and lists the top three recreation activities receiving the most participation in 1987 as reported by the recreation manager. Table 10-3 lists other Reclamation-owned recreation sites using or affected by CVP water. The locations of the sites listed in Tables 10-1 and 10-2 are shown in Figure 10-1, Glenn-Colusa Irrigation District (GCID) and Orland-Artois Water District (OAWD); Figure 10-2, Central California Irrigation District (CCID), San Luis Water District (SLWD), Fresno Irrigation District (FID) and Westlands Water District (WWD); and Figure 10-3, Alta Irrigation District (AID) and Lower Tule River Irrigation District (LTRID). Of the total 51 CVP recreation sites owned by the Bureau of Reclamation, 13 lie within or near the SAs, and are included in this study. The State and Federal wildlife preserves, refuges, and management areas receiving CVP waters that are located near the eight SAs areas are studied. These wildlife areas provide a variety of formal recreational opportunities, which are managed by the California Department of Fish and Game, the USFWS, and the Bureau of Reclamation. Fishing, frogging, nature study, camping, sightseeing, as

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TABLE 10-1

## STATE AND FEDERAL WILDLIFE PRESERVES WITH RECREATION ACTIVITIES USING OR AFFECTED BY CENTRAL VALLEY PROJECT WATER WITHIN OR NEAR THE SAMPLE AGENCIES

	Recreation Site	Operating Entity	Recreation Activities <sup>(a)</sup>	Sample Agency
<u>WILDLIFE PRESERVES (Wildlife Management Area, Wildlife Areas, and National Wildlife Refuges)</u>				
1(b)	Merced National Wildlife Refuge	USFWS	Hunting, Photography, and Sightseeing	Near CCID
2(b)	San Luis National Wildlife Refuge	USFWS	Hunting, Fishing, and Sightseeing	Near CCID
3(c)	Delevan National Wildlife Refuge	USFWS	Hunting, Sightseeing, and Picnicking	Adjacent to GCID
4(c)	Sacramento National Wildlife Refuge	USFWS	Hunting, Photography, and Sightseeing	Adjacent to GCID
5(d)	Kesterson National Wildlife Refuge	USFWS	Hunting, Nature Photography, and Sightseeing	Near SLWD
6(d)	San Luis Reservoir Wildlife Area	CDFG	Deer Hunting, Small Game and Turkey Hunting.	Near SLWD (adjacent to San Luis Reservoir)
7(d)	O'Neill-Forebay Wildlife Area	CDFG, CDP&R	Dog Trials, Pheasant Hunting, and Dove Hunting	Near SLWD (adjacent to O'Neill-Forebay Reservoir)
8(d)	Los Banos WMA	CDFG	Fishing, Camping, and Water Fowl Hunting	Near SLWD
9(d)	Volta Wildlife Area	CDFG	Water Fowl Hunting, Fishing, Sightseeing	Near SLWD (adjacent to CCID)
10(d)	Little Panoche Reservoir Wildlife Area	CDFG	Small Game Hunting, Fishing, and Sightseeing	Near SLWD
11(d)	Mendota WMA	CDFG	Hunting, Fishing, Camping	Near WWD
12(d)	Kern National Wildlife Refuge	USFWS	Hunting, Photography, and Sightseeing	Near LTRID

(a) Recreation activity levels represent the top three activities in total visitors.

(b) Do not receive CVP water.

(c) In response to the drought effects on wildlife, these USFWS National Wildlife Refuges have received CVP waters this year and the previous year only; the Bureau of Reclamation does not own these sites (Petrinovitch, 1992a)

(d) These sites do receive Central Valley Project waters.

SOURCE: US Bureau of Reclamation, 1992; Petrinovitch, 1987



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TABLE 10-2

## BUREAU OF RECLAMATION-OWNED RECREATION SITES USING OR AFFECTED BY CENTRAL VALLEY PROJECT WATER WITHIN OR NEAR THE SAMPLE AGENCIES

	Recreation Site	Operating Entity	Recreation Activities(a)	Sample Agency
<u>CVP LAKES AND RESERVOIRS</u>				
1	San Luis Reservoir (SRA)	CDP&R	Fishing, Camping, and Picnicking	Near SLWD
2	Los Banos Detention Reservoir	CDP&R	Fishing, Non-motorized boating, Camping.	Near SLWD
3	Kesterson Reservoir	Reclamation	Hunting, Nature Photography, Sightseeing	Near SLWD (adjacent to the Kesterson NWR)
4	O'Neill-Forebay	CDP&R, CDFG	Fishing, Picnicking, Camping	Near SLWD
5	Millerton Lake (Friant) SRA	CDP&R and BLM	Motorized Boating, Water-skiing, Camping	Near FID
<u>CVP RIVERS AND CANALS</u>				
1	Delta-Mendota Canal Site 2A	Stanislaus Co. Parks and Facilities Dept.	Fishing, Sightseeing, Hiking	Near SLWD
2	Canyon Road Fishing Access	Merced County Parks and Recreation Division	Fishing, None, None.	In SLWD
3	Mervel Angling Site	Merced Co. Parks and Recreation Division	Fishing, None, None.	In SLWD
4	Fairfax Fishing Access	Fresno Co. Parks Division	Fishing, Sightseeing, None.	In WWD
5	Three Rocks Fishing Access	Fresno Co. Parks Division	Fishing, Sightseeing, Nature Photography	In WWD
6	Huron Fishing Access Area	Fresno Co. Parks Division	Fishing, None, None.	In WWD
7	Delta Mendota Canal Site 5	Fresno Co. Parks Division	Fishing, None, None.	Near WWD
8	Avenal Cut-off Fishing Access	Kings Co. Dept. of Parks and Recreation	Fishing, None, None.	In WWD

(a) Recreation activity levels represent the top three activities in total annual visitors.

SOURCE: US Bureau of Reclamation, 1992.

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TABLE 10-3

## OTHER BUREAU OF RECLAMATION-OWNED RECREATION SITES USING OR AFFECTED BY THE CENTRAL VALLEY PROJECT

	Recreation Site	Operating Entity	Recreation Activities	12-Hour Visitor Days in 1991
1	Lake Cahuilla	Riverside County	Fishing, Camping, and Picnicking	95,663
2	Salton Sea National Wildlife Refuge	USFWS	Hunting, Nature Photography, Sightseeing	8,333
3	Salton Sea State Recreation Area	CDP&R	Fishing, Camping, and Picnicking	167,755
4	Cachuma Lake Recreation Area	Santa Barbara County	Motorized Boating, Fishing, Camping	510,571
5	Auburn Reservoir	CDP&R	Swimming, Camping, Picnicking	319,937
6	Clair Engle Lake (Trinity)	USDA - Forest Service	Camping, Motorized and Non-Motorized Boating	716,733
7	Contra Costa Canal Trail	East Bay Regional Park District	Hiking and Biking	66,667
8	Contra Loma Reservoir	Contra Loma Regional Parks	Swimming, Picnicking, and Fishing	68,498
9	Folsom Lake State Recreation Area	CDP&R	Swimming, Motorized Boating, and Picnicking	520,833
10	Folsom South Canal Recreation Trail	Bureau of Reclamation	Hiking and Biking	375
11	Jenkinson Lake (Sly Park)	El Dorado Irrigation Dist.	Fishing, Motorized Boating, and Camping	1,383
12	Keswick Reservoir	Shasta County	Fishing, Motorized Boating, and Sightseeing	500
13	Lake Natoma	CDF&G	Non-Motorized Boating, Fishing, and Sightseeing	125,052
14	Lake Woollomes (Delano)	Kern County	Picnicking, Sightseeing, and Swimming	91,685
15	Lewiston Lake	USDA - Forest Service	Motorized Boating, Fishing, and Camping	82,467
16	New Melones Lake	Bureau of Reclamation	Fishing, Motorized Boating, and Waterskiing	503,895
17	Nimbus Fish Hatchery	CDF&G	Fishing, Sightseeing, and Photography	28,306
18	Nimbus Dam Shoals Fishing Access Site	CDF&G	Fishing, Sightseeing, and Photography	21,750
19	Red Bluff Diversion Reservoir	Bureau of Reclamation	Fishing, Camping, and Picnicking	80,000
20	San Justo Reservoir	San Benito County	Fishing, Swimming, and Motorized Boating	5,015
21	Shasta Lake	USDA - Forest Service	Camping, Waterskiing, and Motorized Boating	2,421,650
22	Squaw Leap	Bureau of Land Management	Hiking, Horseback Riding, and Sightseeing	3,667
23	Sugar Pine Reservoir	USDA - Forest Service	Camping, Picnicking, and Fishing	42,456
24	Trinity River Fish Hatchery	CDF&G	Sightseeing, Fishing, and Photography	757

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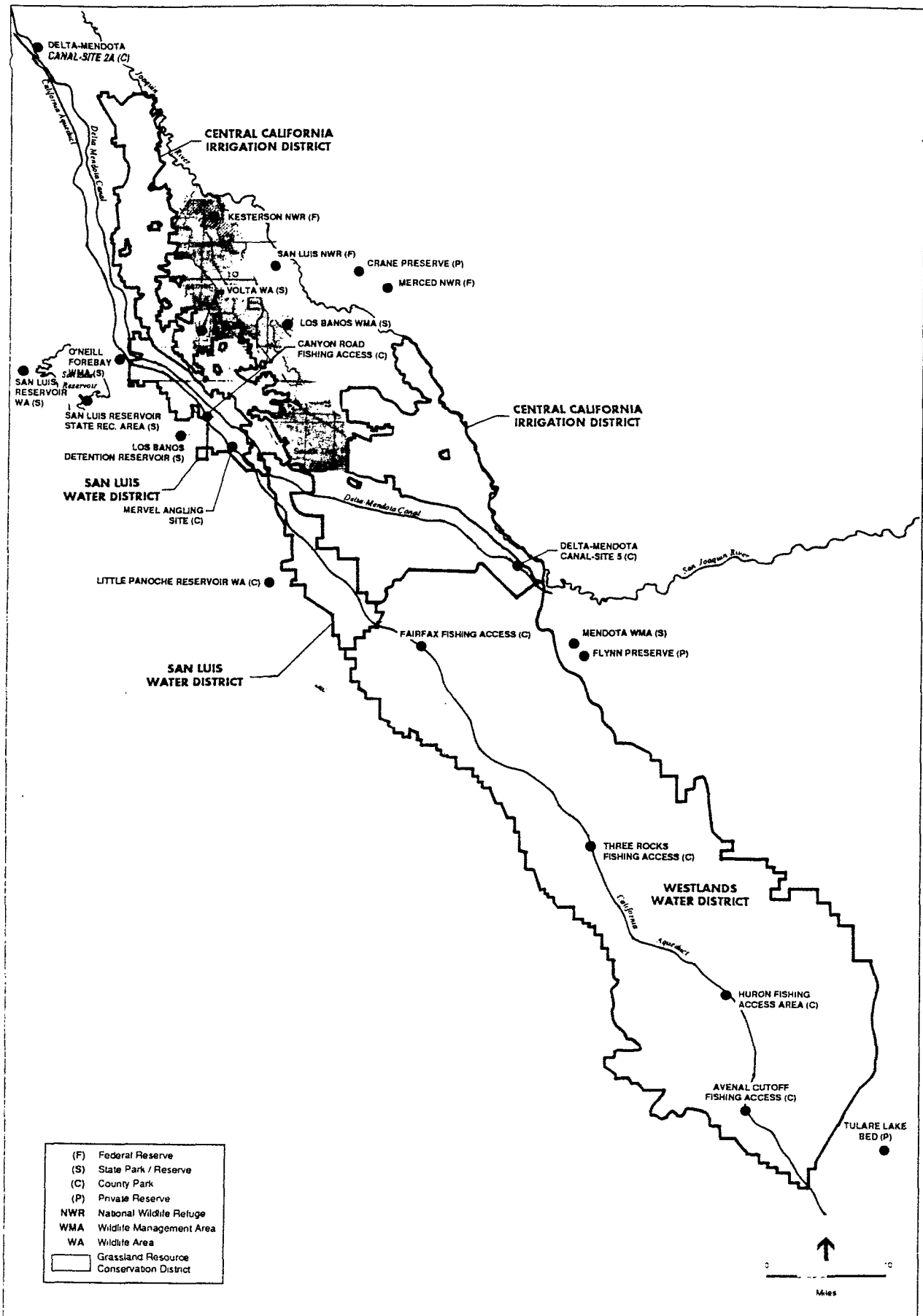
TABLE 10-3 (Continued)

## OTHER BUREAU OF RECLAMATION-OWNED RECREATION SITES USING OR AFFECTED BY THE CENTRAL VALLEY PROJECT

	Recreation Site	Operating Entity	Recreation Activities	12-Hour Visitor Days in 1991
25	Whiskeytown Reservoir	National Park Service	Swimming, Motorized Boating, and Sightseeing	524,091
26	Clear Lake National Wildlife Refuge	USFWS	Sightseeing and Hunting	422
27	Lower Klamath National Wildlife Refuge	USFWS	Sightseeing and Hunting	5,720
28	Tule Lake National Wildlife Refuge	USFWS	Sightseeing and Hunting	7,345
29	East Park Reservoir	Bureau of Reclamation	Fishing, Camping, and Waterskiing	54,350
30	Stony Gorge Reservoir	Bureau of Reclamation	Fishing, Camping, and Picnicking	15,550
31	Lake Berryessa	Bureau of Reclamation	Motorized Boating, Fishing, and Waterskiing	1,056,257
32	Lake Solano	Solano County	Picnicking, Swimming, and Camping	102,500
33	Putah Creek Angling Access Site	CDF&G	Sightseeing and Fishing	775
34	Boca Reservoir	USDA - Forest Service	Fishing, Camping, and Waterskiing	68,380
35	Lake Casitas State Recreation Area	Casitas Municipal Water District	Sightseeing, Fishing, and Camping	485,993
36	Prosser Creek Reservoir	USDA - Forest Service	Fishing, Motorized Boating, and Picnicking	15,168
37	Stampede Reservoir	USDA - Forest Service	Fishing, Camping, and Motorized Boating	64,936
38	Lake Oroville	CDP&R	Motorized Boating, Camping, and Fishing	

SOURCE: US Bureau of Reclamation, 1992.

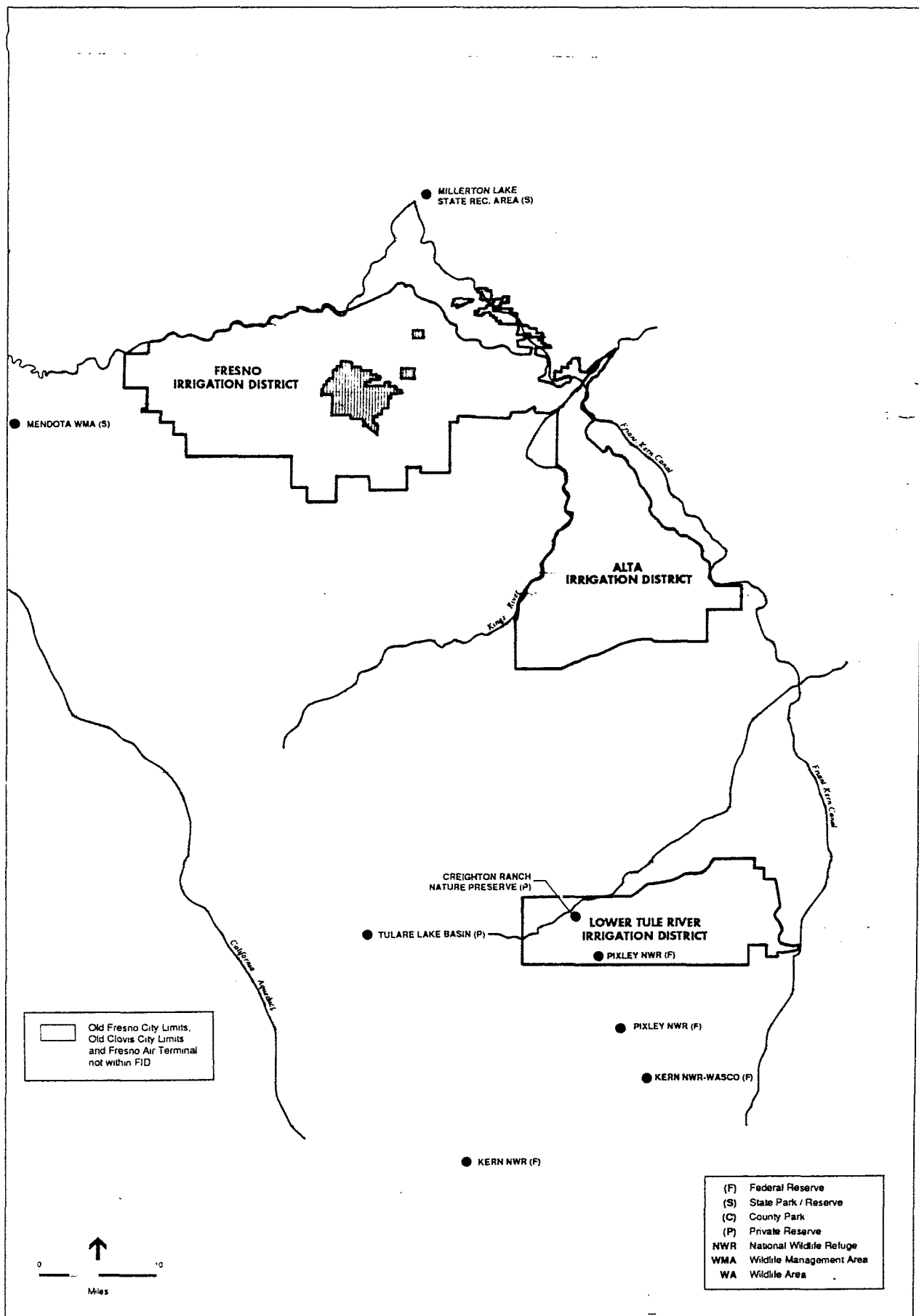




WILKIE Environmental Science Associates, Inc.

Reclamation Reform Act EIS / 920468

**Figure 10-2**  
Recreation / Nature Reserves:  
San Joaquin Valley - West



SOURCE: Environmental Science Associates, Inc.

Reclamation Reform Act EIS / 920468

well as hunting waterfowl and small game are among the activities available in the wildlife preserves (Reclamation, 1992).

Within the Central Valley and the SAs, hunting organizations, particularly those for waterfowl, have private lands designated for exclusive recreational use. Most of these lands are marsh or are inundated periodically. These lands attract a diversity of birds and animals for hunting and observation (Reclamation, 1992). Private facilities often offer water access for fishing and beach activities for a fee. Some landowners also allow fishing, hunting, and other activities on their property for a fee. Recreation use of private lands, however, will not be described in this analysis because the user data are not readily available and comparable among sites.

#### **4.0 NON-RRA FACTORS CONTROLLING CHANGES IN RECREATION VISITATION**

The implementation of RRA regulations is only one of many factors which may have had an effect on recreational use levels within the SAs. The following is a list of possible causes for changes in recreational use levels in the sample agencies:

- Many of the recreation sites in the sample agencies probably draw a large amount of their visitors from local communities. Population increases in the SA are described in Task 11 Technical Memoranda, Sociology. The background increase in population during the study period would likely result in an associated increase in visitation at recreation sites.
- The high oil prices of the late seventies may have prompted a reduction in fuel-dependent recreational activities such as boating, while also discouraging travel to the sites by automobile, particularly for out of area recreationists. Conversely, the relatively low price of oil in the 1980's may have encouraged auto travel and boating, including out of area recreationists.
- The recessions in the nation's economy (the mid 1970's, the early 1980's, and early 1990's) would likely have reduced the amount of money the people would be willing to spend on recreation. This could result in less visits as people travel less. However, it is also possible that more people could have visited the selected sites as an alternative to more costly vacations.
- The drought, which has lasted for six years in California, has possibly affected recreational user levels at some sites in the Central Valley as people decreased their use of water-based recreation at sites with low water levels; some probably sought out substitute water-based facilities where the effects of the drought are less evident; or some sought out alternative non-fresh-water dependent recreational facilities.

## RECREATION TECHNICAL MEMORANDUM

- Aside from the drought, water levels in CVP reservoirs vary according to a number of factors including water deliveries, operational needs of the reservoir, increased use as a hydraulic junction, etc. Changes in visitation at the source reservoirs may reflect these other causal influences.
- Steadily increasing populations in the Central Valley and the rest of California have put a larger demand on the recreational resources as total annual visitation levels increase. As user levels increase, there is sometimes a decrease in the desirability of a recreation site. This could affect user levels as the perception changes of the site's crowdedness.
- Historically, private lands have been utilized by the public for recreation as long as user levels were fairly low and did not impact the lands significantly. Now, as the population and the demand for recreation increases, many landowners may no longer be willing to allow large numbers of users to have access to their land. This, in turn, creates an increased demand for the available public sites.
- At some recreation sites, there may have been effects on recreational use because of facility development. For example, the development of a marina or boat landing is an attractant that draws in recreationists.
- Reduced amounts of leisure time and longer working periods for Americans could also influence recreational use trends. Recreation literature (*The Overworked American: The Unexpected Decline of Leisure*, by Juliet Schor and Laura Leete-Guy) from the Washington Based Economic Policy Institute, indicates that full-time workers on the average put in 138 hours more a year in 1989 than they did in 1969.

Any of the above, and other factors also, could affect the recreation use levels at any given site. The relationships identified above, while plausible, are not supported by specific data. In each case, the necessary information relates to recreation user attitudes, which define the choices of preferred activities and the locations at which they are carried out. User attitude surveys are available for California as a whole, however, surveys on attitudes towards recreation in the Central Valley are not available and, therefore, the list of possible controls over recreation is speculative, although likely significant. Population changes in particular, local and regional, usually have a direct effect on visitation levels at recreation sites. To further define the setting for each district, population variations will be discussed for each individual district.



## **5.0 CHANGE ASSESSMENTS: CONTROL DISTRICTS**

### **5.1 CENTRAL CALIFORNIA IRRIGATION DISTRICT**

National Wildlife Refuges (NWR) near the Central California Water District include the San Luis NWR and the Merced NWR. There are no State Preserves or Reclamation-owned recreation sites in the Central California Irrigation District.

The 7,340-acre San Luis NWR is located in Merced County eight miles north of the City of Los Banos and is part of the Grassland Resource Conservation District. The refuge lies within the historic floodplain of the San Joaquin River. The refuge consists mainly of marshlands and riparian zones along sloughs and channels. Elevations range from 75 to 90 feet mean sea level. Approximately 2,700 acres of the refuge are marshes, 3,940 are grasslands, and 700 acres are riparian habitat. Wildlife observation, fishing, and waterfowl hunting are the major public use activities on the refuge.

The 2,561-acre Merced NWR is located in Merced County approximately 10 miles southwest of the City of Merced. The Merced NWR is comprised of wetland, cropland, and upland. Approximately 600 acres are farmed under a cooperative farming agreement, from which the Refuge receives a portion for wildlife use. About 1,200 acres have been developed for wintering and migrating waterfowl. In addition, 645 acres lie within the Eastside Bypass as part of the San Joaquin Flood Control Project. The refuge provides an important resource for nesting, wintering, and migratory habitat in the San Joaquin Valley in addition to providing habitat for several endangered and candidate animal species (Reclamation, 1992). Elevations in the refuge range from 98 to 112 feet mean sea level. Wildlife observation and photography, as well as waterfowl and pheasant hunting are activities in the refuge.

#### **5.1.1 Pre-Hammer Clause Setting (Prior to 1987)**

The San Luis NWR experienced an 18 percent increase in total use between 1985 and 1987 (Table 10-4 and Figure 10-4). The total number of visitors rose from about 13,540 to 15,970 during this period. Most of the growth during this period was in the consumptive uses category (hunting, fishing, etc.) which rose 26 percent (Table 10-4 and Figure 10-5). Consumptive uses are activities such as hunting and fishing, while non-consumptive uses include all other activities

# RECREATION TECHNICAL MEMORANDUM

TABLE 10-4

## SUMMARY OF TOTAL USE AT NATIONAL WILDLIFE REFUGES IN THE CENTRAL CALIFORNIA IRRIGATION DISTRICT

Year	San Luis National Wildlife Refuge	Merced National Wildlife Refuge
1985 - 86	13,544	1,646
1986 - 87	14,535	1,580
1987 - 88	15,967	2,237
1988 - 89	14,693	3,111
1989 - 90	12,118	3,316
1990 - 91	12,734	4,030
1991 - 92	13,825	4,527

SOURCE: U.S. Fish and Wildlife Service

Total visitation at the Merced NWR rose 36 percent between 1985 and 1987 from about 1,650 to 2,240 (Table 10-4 and Figure 10-4). Consumptive use actually experienced a 41 percent decrease, from 444 to 260, during this period (see Table 10-5 and Figure 10-5). This was overshadowed, however, by the increase in non-consumptive use at the refuge. The result was an overall increase in visitation between 1985 and 1987.

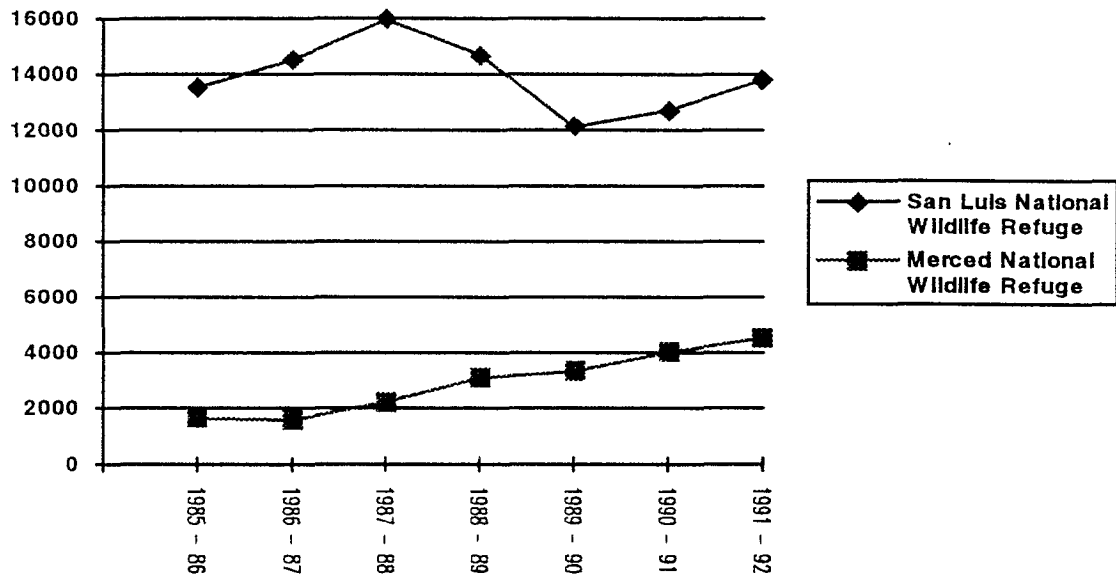
### 5.1.2 Post-Hammer Clause Implementation Setting (1987-Present)

The San Luis NWR experienced a 24 percent decrease in total visitation, from about 15,970 to 12,120, during the period from 1987 to 1989 (Table 10-3 and Figure 10-4). From 1989 to 1991 there was a steady increase in total visitation at the Refuge. Total visitation rose 12 percent during this period from about 12,120 to 13,830. Most of this was due to the increase in consumptive use, which rose 23 percent at the Refuge during this period (Table 10-5 and Figure 10-5).

The Merced NWR experienced a 51 percent increase in total visitation from 1987 to 1991. Total visitation generally increased from about 2,240 to 4,530 during this period (Table 10-4 and Figure 10-4). Consumptive use experienced an overall decrease of 22 percent, from 260 to 203, during this period (Table 10-5 and Figure 10-5). This

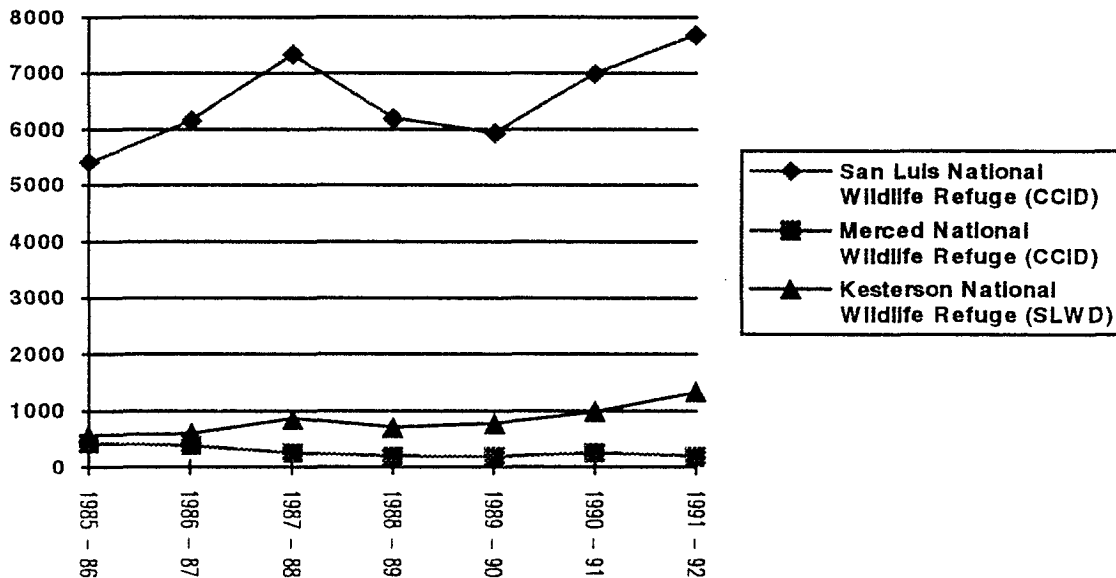
# RECREATION TECHNICAL MEMORANDUM

Figure 10-4 Summary of Total Use at NWRs in the Central California Irrigation District, 1985-1991



Source: U.S. Fish and Wildlife Service

Figure 10-5 Summary of Consumptive Use at Selected National Wildlife Refuges, 1985-1991



Source: U.S. Fish and Wildlife Refuge

# RECREATION TECHNICAL MEMORANDUM

Table 10-5

## SUMMARY OF CONSUMPTIVE USE AT SELECTED NATIONAL WILDLIFE REFUGES

Year	San Luis National Wildlife Refuge (CCID)	Merced National Wildlife Refuge (CCID)	Kesterson National Wildlife Refuge (SLWD)
1985 - 86	5,417	444	585
1986 - 87	6,156	395	610
1987 - 88	7,329	260	875
1988 - 89	6,200	211	725
1989 - 90	5,947	197	783
1990 - 91	7,002	261	983
1991 - 92	7,700	203	1,334

SOURCE: U.S. Fish and Wildlife Service

decrease in consumptive use visits was overshadowed by the increases in non-consumptive use, resulting in the overall increase in visitation observed.

### 5.1.3 Change Assessment for the Central California Irrigation District

The CCID does not receive Reclamation contract water and recreation sites in this district potentially could function as controls. However, the San Luis NWR has been receiving some Reclamation water since 1986 and could have been affected by the 1987 and 1988 RRA regulations. The Merced NWR will eventually receive CVP water but it does not yet have a water delivery system (Zahm, 1992). The changes in recreational visitation at the Merced NWR, then, are attributed to background ("noise") factors, as identified in Section 1.4, since the patterns cannot be related to implementation of regulations for the RRA.

The following change in visitation levels was found in the use data for the Central California Irrigation District. Figure 10-4 shows how the total number of recreational users for the two NWRs have changed in Central California Irrigation District since 1980. As shown in Table 10-4, recreation visitation at the San Luis National Wildlife Refuge increased by 2 percent between the beginning, and the end of the 6-year data record. The refuge experienced a substantial increase in visitation at first, followed by a decline in the interim period, and an eventual increase in 1991 to slightly above 1985 levels.

The very different trends and the variation from year to year at the two sites over the entire time period of the data sets (e.g. Figures 10-4 and 10-5 from 1985 to 1991) suggest that various local factors, over the long term, strongly influence visitation levels at any one year. These factors could be related to several factors which affect wildlife population levels, as discussed in the Technical Memorandum on Wildlife. Additionally, changes may be attributed to other factors, especially the drought and increases in the background population, as discussed in sub-section 2.1 of this Technical Memorandum. Population, in particular, increased by 37 percent in the Central California Irrigation District over the period from 1980 to 1990 (Task 11 Technical Memorandum, Social Impacts). Also, increased interest in wildlife and awareness of the recreational resources available may have changed during the study period.

In summary, the CCID refuge sites have experienced different patterns in visitation over the study period. The different trends are difficult to explain with the available information, but the Merced and San Luis NWRs do experience very different levels of use. During the period studied, San Luis NWR has consistently had more than 10 times as much consumptive use as Merced NWR. Also, total use at San Luis NWR was 11,900 more than Merced NWR in 1985 and was still 9,300 more in 1991. For these reasons, the patterns of use at the CCID recreation sites are difficult to compare to each other or to the patterns at the other wildlife areas. Since the control SAs recreation trends are disparate and attributable to many different factors, a linkage between the pattern of recreation use and other variables cannot be identified.

## **5.2 ALTA IRRIGATION DISTRICT**

There are no National or State Wildlife preserves receiving CVP water located in or nearby the Alta Irrigation District. There are no Reclamation-owned reservoirs used for recreation located in or near the Alta Irrigation District.

## **6.0 CHANGE ASSESSMENT: SACRAMENTO VALLEY (NORTHERN) DISTRICTS**

### **6.1 GLENN-COLUSA IRRIGATION DISTRICT**

National Wildlife Refuges adjacent to the Glenn-Colusa Irrigation District include: Sacramento NWR and Delevan NWR. These refuges have received Reclamation

waters in this year and the previous year by special arrangement with the Bureau of Reclamation in response to the continuing drought's effect on wildlife in these refuges (Petrinovitch, 1992a).

The Sacramento NWR is part of a group of refuges, including Delevan NWR, which are located in the Colusa drainage basin (see Figure 10-1). The area also contains numerous private duck hunting clubs. The 10,783 acre refuge complex is generally comprised of permanent ponds, man-made marshland, and croplands.

The 10,783-acre Sacramento NWR, located about six miles south of Willows, is surrounded by the Glenn-Colusa Irrigation District to the north, south, and west. It receives water from the CVP on an "as-available" basis from the Sacramento River and Stony Creek (Reclamation, 1987). Facilities include opportunities for viewing of birds and non-game animals, a visitor center, nature study programs, interpretive trails, picnicking, and a viewing platform; hunting is also permitted.

The 5,634-acre Delevan NWR is located about seven miles east of Maxwell. The refuge receives interim CVP water supplies (Reclamation, 1977). It is adjacent to the Glenn-Colusa Irrigation District and consists of natural ponds, millet fields, and irrigated pasture. Recreation activities include opportunities for viewing of birds and non-game animals, picnicking, and interpretive trails; hunting is also permitted.

#### 6.1.1 Pre-Hammer Clause Setting (Prior to 1987)

The Sacramento NWR experienced an 100 percent increase in total use between 1980 and 1986 (Table 10-6 and Figure 10-6). The total number of visitors rose from about 26,390 to 52,960 during this period. From 1986 to 1987 there was decrease of about 34 percent, with visitation dropping to 34,930.

Total visitation at the Delevan NWR rose 35 percent between 1980 and 1986 from about 4,250 to 5,750 (Table 10-6 and Figure 10-6).

#### 6.1.2 Post-Hammer Clause Implementation Setting (1987-Present)

From 1987 to 1989, the Sacramento NWR experienced an 84 percent increase in total visitation, rising from 34,930 to 64,445. After 1989, visitation levels dropped by 30

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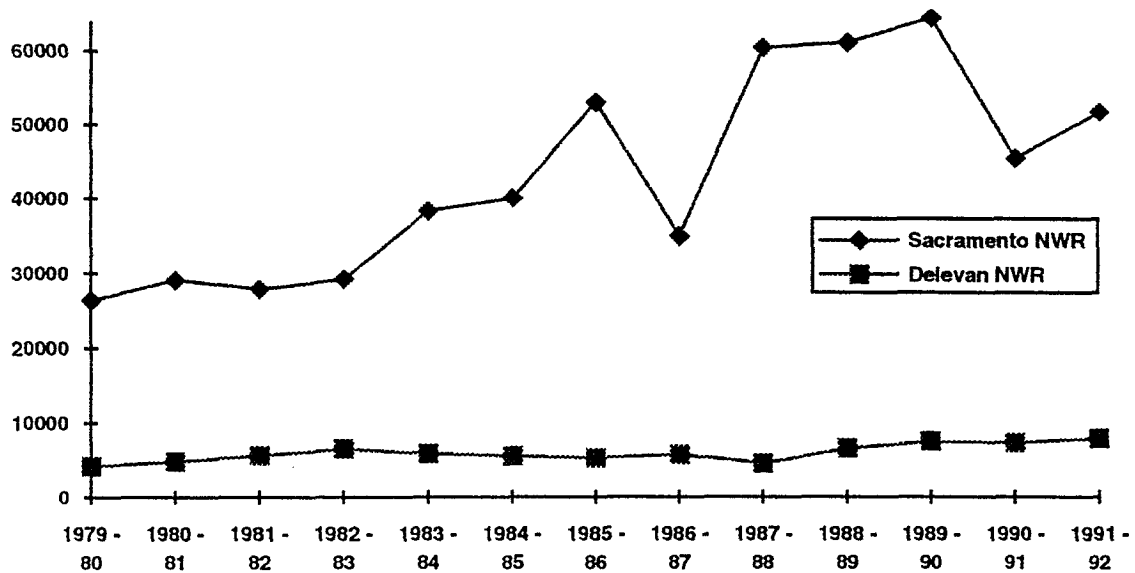
TABLE 10-6

## SUMMARY OF TOTAL USE AT NATIONAL WILDLIFE REFUGES IN THE GLENN-COLUSA IRRIGATION DISTRICT

Year	Sacramento NWR	Delevan NWR
1979 - 80	26,392	4,247
1980 - 81	29,101	4,842
1981 - 82	27,846	5,697
1982 - 83	29,249	6,541
1983 - 84	38,336	5,941
1984 - 85	40,052	5,607
1985 - 86	52,959	5,406
1986 - 87	34,933	5,756
1987 - 88	60,353	4,646
1988 - 89	61,036	6,661
1989 - 90	64,445	7,533
1990 - 91	45,409	7,361
1991 - 92	51,620	8,003

SOURCE: U.S. Fish and Wildlife Service

Figure 10-6 Summary of Total Use at NWR's in the Glenn-Colusa Irrigation District from 1980-1991



## RECREATION TECHNICAL MEMORANDUM

percent to 45,409 in 1990. After that visitation rose again by 14 percent to 51,620 in 1991.

The Delevan NWR experienced a 19 percent decrease in visitation from 1987 to 1988, when visitor levels dropped from 5,756 to 4,646. From 1988 to 1991 visitation levels have risen by 72 percent, from 4,646 to 8,003.

### 6.1.3 Change Assessment for the Glenn-Colusa Irrigation District

The Sacramento NWR had a 96 percent increase in visitation from the beginning to the end of the 11-year data record. Figure 10-6 shows how the total number of recreational users at the Sacramento and Delevan NWRs has changed in the Glenn-Colusa Irrigation District since 1980. There is no notable trend difference, or difference in the variation in the trend line, between pre- and post-Hammer Clause implementation.

If the RRA regulations were the cause of the changes in recreation visitation in this SA, it would be expected that this change would become apparent from about 1987 to the present. As described in research question Nos. 1 through 5, implementation of the 1987 and 1988 RRA regulations could have both increased or decreased visitation levels under different linkages. The data sets for this SA show both an increase and a decrease over the periods, but with total visitation at the Sacramento and Delevan NRWs increasing.

Some of the research questions postulate that the RRA regulations effect(s) on hydrology could either increase or decrease visitation levels depending upon the scenario (Research Question Nos. 2 and 3). It would be difficult to attribute the recreation use changes to the RRA regulations because, at any of the sites, no trend was observed beginning in 1987 that deviated from the overall trend. In addition, the high variation from year to year at most of the sites over the entire time period of the data sets (e.g., Figure 10-6) suggest that other factors aside from the 1987 RRA implementation, over the long term, influence annual visitation levels. These factors could include changes in the habitat and food supply of the wildlife using the refuges (as described in the Task B Technical Memoranda, Wildlife Resources), in addition to other background factors, especially the drought and increases in the background population, as discussed in Section 4.0 of this Technical Memorandum. Population



increased by about 28 percent in the Glenn-Colusa Irrigation District over the period from 1980 to 1990 (Task 11 Technical Memorandum, Social Impacts).

If the RRA were the agent of change, the periods of decreasing visitation at the Sacramento or Delevan NWRs could have been caused by increased ground water pumping of shallow ground water that negatively affected water levels and water quality at the preserve (Research Question No. 1).

The background technical memoranda for the following issue areas have not demonstrated any significant physical or demographic changes in the SAs related to implementation of the RRA: Groundwater / Drainage, Water Quality, Land Use, Land Ownership, Social Impacts, and Economics. Because no changes were found in any of these areas, there appears to be no mechanism related to the RRA which would cause a significant change in recreation.

The changes in recreation visitation levels for the Glenn-Colusa Irrigation District have probably been caused by a combination of factors. It is difficult to establish any definitive linkages between changes in visitation levels and the various possible causes with the data that are currently available.

## **6.2 ORLAND-ARTOIS IRRIGATION DISTRICT**

There are no CVP reservoirs/lakes or rivers/canals, and no State wildlife areas in the Orland-Artois Water District. See the above discussion under the Glenn-Colusa Irrigation District for a discussion of nearby National Wildlife Refuges.

## **7.0 CHANGE ASSESSMENT: SAN JOAQUIN VALLEY (SOUTHERN) DISTRICTS**

### **7.1 SAN LUIS WATER DISTRICT**

National Wildlife Refuges in or adjacent to the San Luis Water District include the San Luis NWR and Kesterson NWR. State wildlife (management) areas include: Los Banos Wildlife Management Area, San Luis Reservoir Wildlife Area, O'Neill Forebay Wildlife Area, Little Panoche Reservoir Wildlife Area, and Volta Wildlife Area. Reclamation-owned reservoirs include the San Luis Reservoir, O'Neill Forebay reservoir, Los Banos Detention Reservoir, and Kesterson Reservoir. Reclamation-

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owned rivers and canals near the SLWD include the Delta-Mendota Canal Site 2, Canyon Road Fishing Access, and Mervel Angling Site. The San Luis Water District contains several important components of the Central Valley Project. The San Luis Unit of the CVP consists of one major dam and reservoir, a forebay dam and a forebay reservoir, two detention dams and reservoirs, two pumping plants, two pumping-generating plants, and two major canals (Kahrl, 1978). Other recreation sites include the newly developed North Grasslands Wildlife Management Area.

Kesterson National Wildlife Refuge is located 18 miles north of the City of Los Banos and four miles north of Gustine. The refuge consists of 1,280 acres of holding ponds, 1,080 acres of natural marshlands, and 3,290 acres of grassland/vernal pool habitat, totaling 5,900 acres (Reclamation, 1988). The Bureau of Reclamation owns the site and provides water to the holding ponds (Petrinovitch, 1992a). The holding ponds are managed by the Bureau of Reclamation and the remainder of the refuge is managed by the US Fish and Wildlife Service. Wildlife / wild land observation and photography, as well as hunting are provided on the refuge. Public hunting of ducks, geese, common snipe, common moorhens, and American coots is allowed.

The 3,200-acre Los Banos Wildlife Management Area is located approximately four miles northeast of the City of Los Banos, and is part of the San Luis Reservoir component of the Central Valley Project (Kahrl, 1978). The refuge is centrally located in the San Joaquin River floodplain and is included in the Grassland Resource Conservation District (Reclamation, 1987). The refuge was established to aid in restoring duck and goose populations by providing habitat and protection from hunting. The refuge management is primarily oriented to the maintenance of native marsh habitat (Reclamation, 1987). Refuge wetlands are the remnants of a much larger seasonal wetlands complex that historically extended throughout the Central Valley (see Task 8A Technical Memorandum, Vegetative Resources). Leading recreational uses of the Los Banos Wildlife Area in 1991 were fishing, camping, and waterfowl hunting, as reported by the California Department of Fish and Game.

The North Grasslands Wildlife Management Area is a relatively new district that has been open to the public for only one year. The Management Area consists of two components: the Salt Slough Unit and the China Island Unit. The Management Area is centrally located in the San Joaquin River floodplain and is included in the Grassland Resource Conservation District (Reclamation, 1987).

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The Volta Wildlife Management Area is owned by the Bureau of Reclamation and has been operated by the CDFG since 1952 under a lease agreement (Reclamation, 1987). Volta WMA is located approximately six miles northwest of the City of Los Banos. The refuge lies within the Grassland Resource Conservation District (GRCD). It consists of approximately 3,000 acres of primarily large alkali ponds and waterfowl areas containing swamp timothy, bulrush, sprangletop, watergrass, and smartweed. Leading identified recreational uses of the Volta Wildlife Area in 1991 were waterfowl hunting, fishing, and sightseeing.

The San Luis Reservoir Wildlife Area is operated by the California Department of Fish and Game and is located approximately fifteen miles west of Interstate 5 on State Route 152. The wildlife area consists of 900 acres of land adjacent to the San Luis Reservoir. Leading identified recreational uses of the San Luis Reservoir Wildlife Area in 1991 were deer hunting, small game hunting, and turkey hunting.

The O'Neill Forebay Wildlife Area is operated by the California Department of Fish and Game and is located approximately ten miles west of Interstate 5 on State Route 152. The wildlife area consists of 700 acres of land below the O'Neill Dam. Leading identified recreational uses of the O'Neill Forebay Wildlife Area in 1991 were dog trials (competition events), and also pheasant and dove hunting.

The Little Panoche Wildlife Area is located 7 miles west of I-5 on Little Panoche Road. The Wildlife area consists of 780 acres surrounding the Little Panoche Reservoir. Leading identified recreational uses of the Little Panoche Wildlife Area in 1991 were small game hunting, fishing, and sightseeing.

The San Luis Dam and Reservoir and the O'Neill Forebay are managed jointly by the State and Federal Government; recreation activities, however, are managed by the California Department of State Parks.

The San Luis Dam is a zoned earthfill structure located on the San Luis Creek near Los Banos. The reservoir has a capacity of 2,041,000 acre-feet (af) and is used to store surplus water of the Sacramento-San Joaquin Delta. The O'Neill Dam and Forebay facilities are located 2.5 miles downstream of the San Luis Dam. The Forebay, which supports recreation facilities, has a capacity of 56,000 af and is used as a hydraulic junction point for State and Federal waters, the top 20,000 af acting as regulator

## RECREATION TECHNICAL MEMORANDUM

storage necessary to permit off-peak pumping and on-peak generation by the William R. Gianelli Pumping-Generating Plant (Kahrl, 1978). The 102-mile-long San Luis Canal carries water southeasterly from O'Neill Forebay along the west side of the San Joaquin Valley. Los Banos and Little Panoche Detention Dams, and Los Banos and Little Panoche Reservoirs are CVP features that are required to protect San Luis Canal by controlling the flows of streams crossing the canal (Kahrl, 1978).

The U.S. Bureau of Reclamation owns the dam and the San Luis Reservoir; principal uses include conservation, irrigation, municipal and industrial uses, recreation, and power generation. San Luis Reservoir has a total land area of 9,184 acres, 120 of which are public recreation acres. The reservoir had 13,000 surface recreation acres with 65 miles of total shoreline in 1987. The reservoir has one campground with 70 campsites, one picnic area, three shelters, two launch ramps, and five ramp lanes. The San Luis Reservoir has 1,100 acres open to public hunting of ducks and geese. The most commonly caught fish are bass, catfish, and beam. Fees are charged for entrance, campgrounds, picnic areas, boat launches and park areas. In 1991, San Luis Reservoir had approximately 268,820 visitors and 2,518,890 visitor hours.

The O'Neill Forebay Reservoir is located east of the San Luis Reservoir and provides fishing, picnicking, and camping recreational opportunities. Fishing is the primary activity at the reservoir. Total site land area is 3,346 acres, of which nine acres are developed for recreation. The reservoir has about 2,700 surface acres in 1987, with 12 miles of shoreline. O'Neill-Forebay has one campground with 70 campsites, 3 picnic areas, 406 tables, 185 shelters, 2 swimming beaches, showers, 2 boat launches, and 4 ramp lanes. Fees are charged for entrance, campgrounds, picnic areas, swimming, boat launch, and park areas. O'Neill Forebay has 1,100 acres open to public hunting. Bass, catfish, and bream are the most commonly caught fish.

The Los Banos Detention Reservoir is located approximately five miles south of the San Luis Reservoir (Figure 10-3). Its holding ponds are cross channel hydrologic features of the San Luis Canal. Recreation activities include picnicking and wildlife viewing.

Several Reclamation-owned rivers and canals, including Canyon Road Fishing Access, Mervel Angling Site, and Delta-Mendota Canal Site 2, provide basic facilities for anglers along the CVP canal distribution system. They generally include an access road from a

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main road, a parking area, and a trail to the canal. The access area itself is usually enclosed to limit anglers to the designated recreation access area on the canal.

### 7.1.1 Pre-Hammer Clause Setting (Prior to 1987)

The Kesterson National Wildlife Refuge experienced a 50 percent increase in consumptive use, from about 590 to 880, between 1985 and 1987 (Table 10-5, Figure 10-5). The Kesterson National Wildlife Refuge does not have an auto tour route or a visitor sign-in area, so the only visitor use records maintained are numbers of hunters. (Cortese, 1992)

Los Banos Wildlife Management Area experienced a steady increase in recreational users from the early seventies until 1982, at which point user levels reached a peak of about 33,520. From 1982, user levels dropped 51 percent to about 16,550 in 1985 and then rose 24 percent to end up at about 20,460 in 1987. Total annual visitors at all of the CDFG wildlife areas are presented in Table 10-7. These data are graphically represented in Figures 10-7 and 10-8. The CDFG data on total number of visitors per year incorporates both appropriate uses at the refuges (i.e., those activities requiring a license: hunting and fishing) and non-appropriate uses at the refuges (nature study, camping, picnicking, bird watching, sightseeing, etc.).

User levels at the Volta WMA rose about 16 percent, from about 10,640 to 12,330, between 1973 and 1976 (see Figure 10-8 and Table 10-6). After that, there was a steady decline in users until 1985, a 61 percent decrease total. From this point on visitation levels increased until 1987. User levels reached approximately 6,300 in 1987. User levels at the San Luis Reservoir WA increased 71 percent, from about 1,010 to 1,720, between 1981 and 1985 (see Figure 10-7 and Table 10-7). From 1985 to 1987 there was a 12 percent decrease in users at the Wildlife Area to about 1,520.

At the O'Neill Forebay Wildlife Area user levels rose 41 percent, from about 1,940 to 2,750, between 1981 and 1982 (see Figure 10-7 and Table 10-7). Between 1982 and 1985 user levels dropped 15 percent to 2,330. From 1985 to 1987 there was a 17 percent increase to 2,820 users.

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TABLE 10-7  
TOTAL ANNUAL VISITORS AT CDFG PRESERVES, 1973-1991  
(NEAREST SAMPLE AGENCY IN PARENTHESES)

YEAR	Los Banos Wildlife Area (Near SLWD)	San Luis Reservoir Wildlife Area (Near SLWD)	O'Neill Forebay Wildlife Area (Near SLWD)	Volta Wildlife Area (Near SLWD)	Mendota Wildlife Area (Near WWD)	Little Panoche Wildlife Area (Near SLWD)	Totals
Pre-Hammer Clause Setting (prior to 1987)							
1973 - 74	22,079	-	-	10,643	27,292	-	60,014
1976 - 77	20,610	-	-	12,332	47,491	-	80,433
1978 - 79	20,892	-	-	11,037	54,654	-	86,583
1981 - 82	29,136	1,011	1,944	8,512	34,104	982	80,126
1982 - 83	33,515	1,338	2,748	6,778	29,881	2,443	83,503
1985 - 86	16,550	1,724	2,330	4,778	44,566	3,010	77,070
Post-Hammer Clause Implementation Setting (1987 - 1991)							
1986 - 87	20,456	1,518	2,820	6,269	40,613	3,520	78,982
1988 - 89	23,129	1,634	2,840	3,899	33,737	3,568	71,629
1991 - 92	34,193	1,182	3,162	3,852	23,265	2,683	70,488

NOTE: Recreation uses are surveyed from July to June each year by the CDF&G.  
SOURCE: ESA 1992, data from the California Department of Fish and Game, 1992.

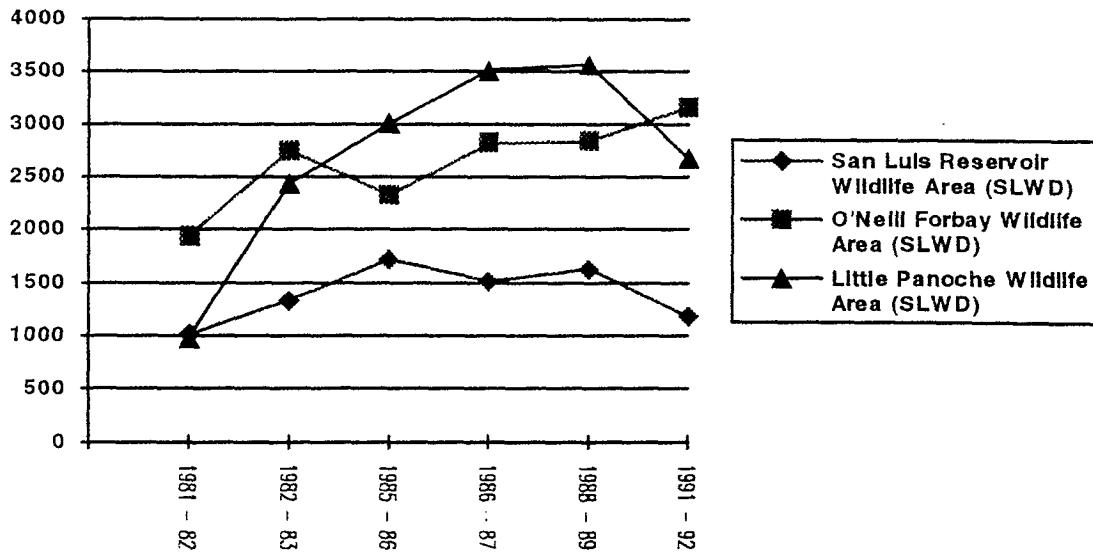
Little Panoche Wildlife Area experienced a rather steady increase in users during this period of time. User levels rose 258 percent from about 980 users in 1981 to 3,520 users in 1987 (see Figure 10-7 and Table 10-7).

The North Grasslands Wildlife Management Area is a newly created wildlife area and no records are available to determine use during this time period.

Column 3 of Table 10-8 shows the total annual visitor days at all Reclamation sites in or near the sample agencies in the San Joaquin Valley. The data are graphically represented in Figures 10-9a, b, and c. A recreation day, as defined by Reclamation

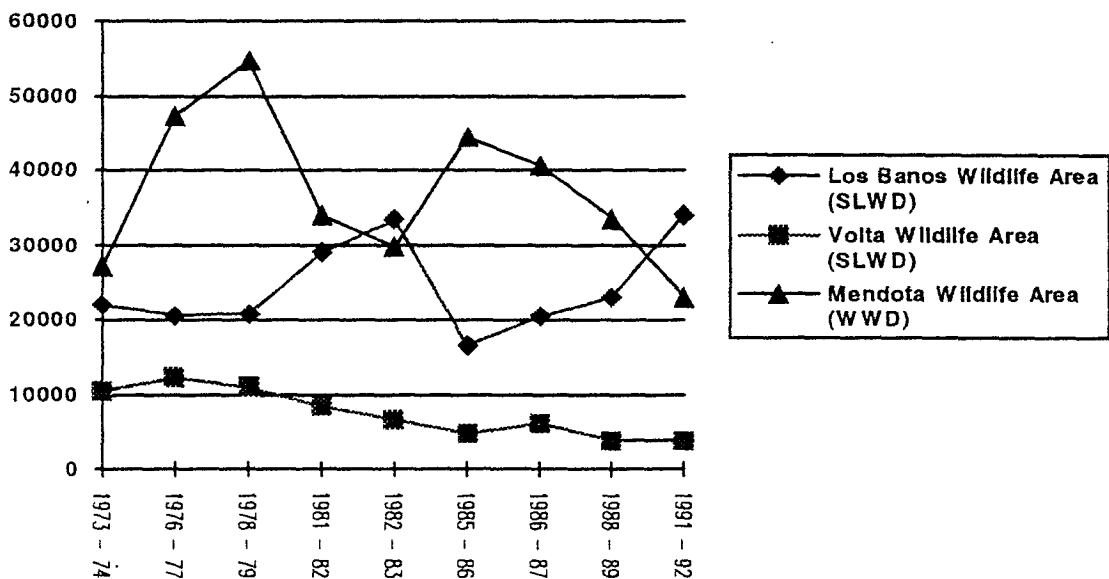
# RECREATION TECHNICAL MEMORANDUM

Figure 10-7 Total Annual Visitors at the San Luis, O'Neill Forebay, and Little Panoche Wildlife Areas, 1981-1991



Source: ESA 1992: data from CDFG, 1992

Figure 10-8 Total Annual Visitors at Los Banos, Volta, and Mendota WMAs, 1973-1991



Source: ESA 1992: data from CDFG, 1992

**TABLE 10-8**  
**ANNUAL VISITOR DAYS AT BUREAU OF RECLAMATION RECREATION SITES IN OR NEAR THE SAN JOAQUIN VALLEY SAMPLE AGENCIES,**  
**1970-1990**  
**(1,000 OF RECREATION DAYS)**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
YEAR	Los Banos Detention Reservoir (SLWD)	San Luis Reservoir (SLWD)	O'Neill Forebay (SLWD)	Kesterson Reservoir (SLWD)	Volta Wildlife Area (SLWD)	D-M Canal Site 2A (SLWD)	Little Panoche Wildlife Area (SLWD)	Canyon Road Fishing Access (SLWD)	Mervel Angling Site (SLWD)	Fairfax Fishing Access (WWD)	Three Rocks Fishing Access (WWD)	Huron Fishing Access (WWD)	D-M Canal Site 5 (WWD)	Avenal Cut-Off Fishing Access (WWD)	Millerton Lake (FID)
<u>Pre-Hammer Clause Setting (prior to 1987)</u>															
1970	n/o	104	124	2	n/o	2	n/o	n/o	n/o	n/o	n/o	n/o	23	n/o	574
1971	n/o	143	182	5	n/o	2	n/o	1	2	n/o	n/o	n/o	23	n/o	591
1972	n/o	370	150	5	14	2	n/o	1	3	n/o	5	0	23	n/o	571
1973	14	89	254	4	12	2	n/o	1	3	6	5	0	22	n/o	687
1974	25	180	213	5	12	1	n/o	2	3	6	6	n/a	23	7	704
1975	29	198	200	4	13	1	n/o	1	3	6	6	4	23	10	807
1976	36	157	203	5	12	1	n/o	2	3	6	6	4	23	11	765
1977	47	241	217	2	n/a	1	2	2	3	6	6	4	23	11	759
1978	72	427	399	2	n/a	1	2	2	3	6	6	4	23	11	1,088
1979	64	358	326	3	10	1	2	2	3	6	6	5	23	11	950
1980	69	381	347	2	10	1	2	2	3	6	6	4	23	11	941
1981(a)	17	104	180	2	4	1	<1	1	1	2	2	1	8	1	524
1982	20	121	247	2	4	1	<1	1	1	2	<1	1	8	1	386
1983	20	58	214	2	3	1	1	1	1	2	2	1	8	1	408
1984	20	58	214	1	4	1	1	1	1	2	2	1	8	1	442
1985	20	195	419	1	n/a	n/a	n/a	1	n/a	n/a	n/a	n/a	n/a	1	667
1986	20	195	419	1	3	1	1	1	1	2	2	1	8	1	575
<u>Post-Hammer Clause Implementation Setting (1987 - present)</u>															
1987	20	195	419	1	3	1	1	1	1	2	2	1	8	1	813
1988	20	195	419	1	3	1	1	1	1	2	2	1	8	1	852
1989	20	302	514	1	3	1	1	1	1	2	2	1	8	1	562
1990	20	268	638	1	3	1	1	1	1	2	2	1	8	1	570

(a) In 1981 the Bureau of Reclamation began using 12-hour visitor days as the standard. Prior to 1981, there were different standard measures of visitor days and collection methodologies varied. A visitor hour is a unit of measurement used by federal agencies to measure duration of recreation use. A visitor hour involves the presence of a person on a recreation site for the purpose of engaging in recreation activities for either continuous, intermittent, or simultaneous periods of time aggregating 60 minutes.

n/o This site was not yet developed ("not open") in the years indicated.

n/a Annual recreation days were not available for these sites in 1985.

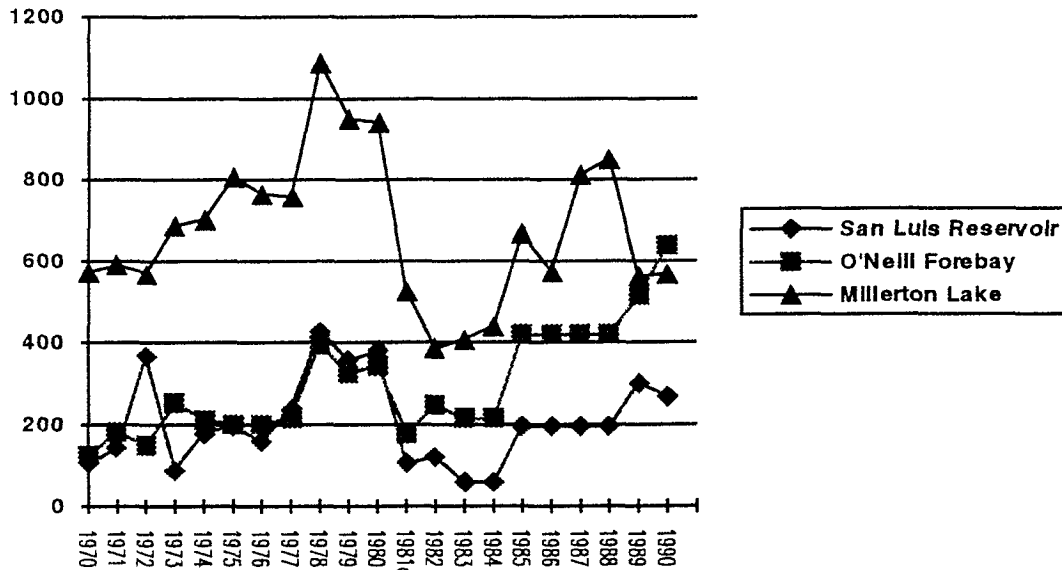
Most data in this table have been rounded to the nearest thousands by Reclamation; data for the fishing access sites was rounded by ESA.

SOURCE: US Bureau of Reclamation, 1992



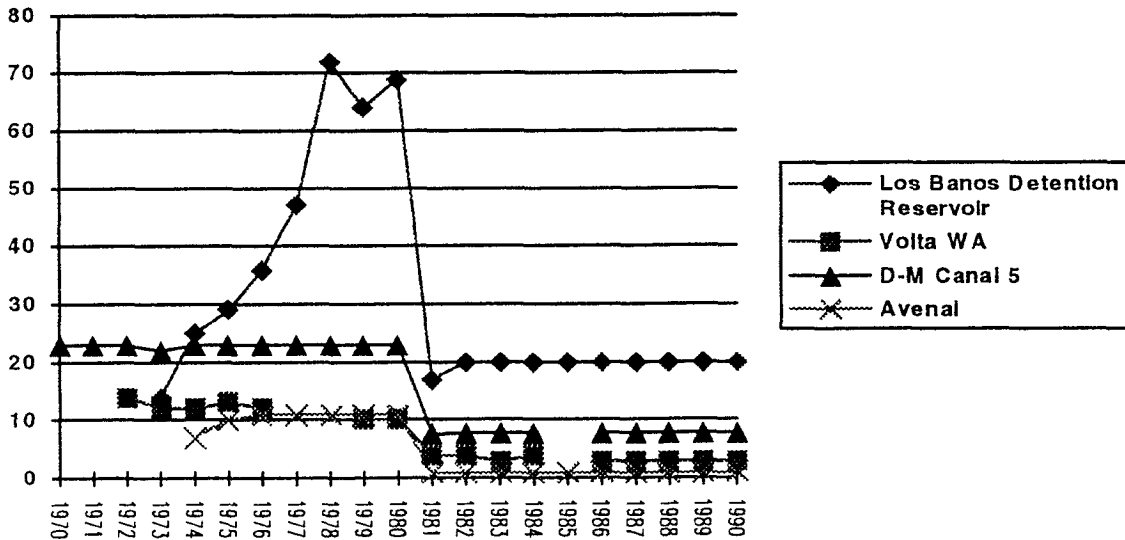
# RECREATION TECHNICAL MEMORANDUM

Figure 10-9a: Annual Visitor Days at Bureau of Reclamation Reservoir  
Recreation Sites In or near the San Joaquin Valley Sample Agencies,  
1970-1990  
(1,000 of Recreation Days)



Source: ESA, 1992; data from CDFG, 1992.

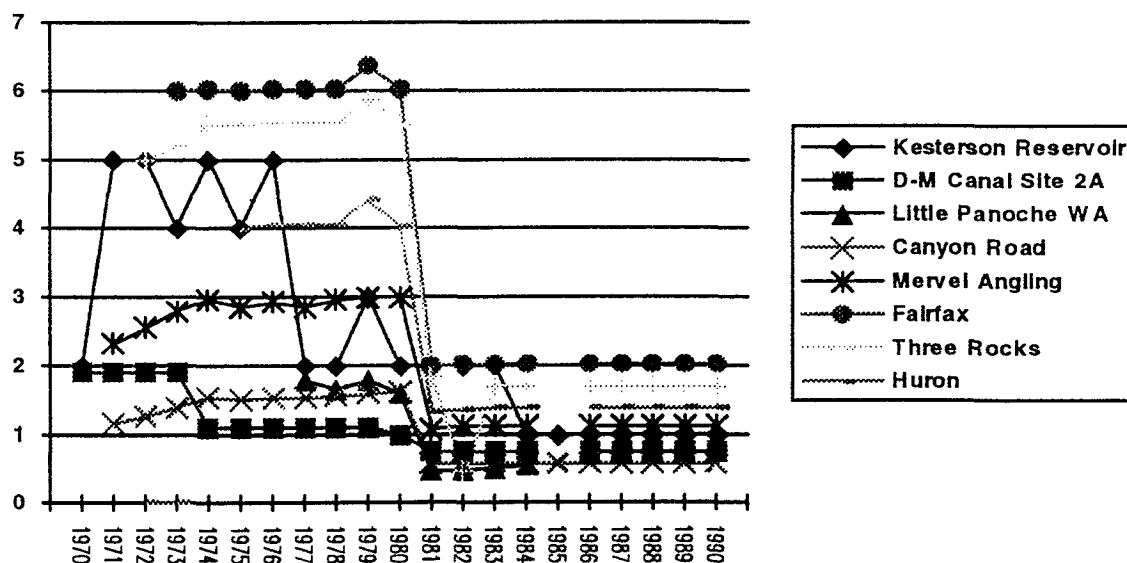
Figure 10-9b: Annual Visitor Days at Bureau of Reclamation Sites In or near  
the San Joaquin Valley Sample Agencies, 1970-1990  
(1,000 of Recreation Days)



Source: ESA, 1992; data from CDFG, 1992.

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Figure 10-9c: Annual Visitor Days at Bureau of Reclamation Sites In or near the San Joaquin Valley Sample Agencies, 1970-1990 (1,000 of Recreation Days)



Source: ESA, 1992; data from CDFG, 1992.

for this data set is 12 hours of visitor use; in 1981, Reclamation began using 12 hour visitor days as the standard.

Visitation more than quadrupled from 1970 to 1978, and then by 1981 fell off to almost 1970 levels. Most Reclamation sites in this study display a similar pattern of decrease in 1981. It appears that this dramatic and consistent decrease in recreation days is probably due to Reclamation's adoption of the 12 hour standard in 1981, which masks any real change in visitation numbers that may have occurred.

As shown in Figure 10-9a, both reservoirs show a similar trend from 1970 to 1987, with a steady increase in visitation up to 1977, a larger increase in 1978 and a falling off in 1981. After 1981, the trend lines show a steady increase again to 1987.

San Luis Reservoir had its peak visitation in 1978 with 427,000 visitor hours, and its lowest visitation in 1983 at 58,000 visitor hours. From 1983 to 1987, however, recreation use levels increased more than 300 percent. The O'Neill Forebay recreation day totals during the 1970-1987 period showed a similar pattern to that of the San Luis

## RECREATION TECHNICAL MEMORANDUM

Reservoir: peak visitation occurred in 1978, and then dropped off to a low in 1981. Visitation at O'Neill Forebay reservoir after 1981, however, increased more rapidly and exceeded visitation at San Luis Reservoir.

Before 1987, visitation levels at the Canyon Road Fishing Access, Mervel Angling Site, and Delta-Mendota Canal Site 2A fishing sites (Table 10-8) generally showed a decrease. However, as with the CVP reservoirs in the San Luis Water District discussed above, this decrease was greatest in 1981 when data collection was standardized.

### 7.1.2 Post-Hammer Clause Implementation Setting (1987-Present)

The Kesterson NWR experienced a steady increase in consumptive use from 1987 to 1991 (see Figure 10-5 and Table 10-5). Rising 52 percent, from about 870 to 1,330, during this period. As noted earlier, the Kesterson National Wildlife Refuge does not have an auto tour route or a visitor sign-in area; the only visitor use records maintained are numbers of hunters (Cortese, 1992).

Los Banos WMA has experienced a steady increase in user levels since 1987, rising from about 20,460 people in 1987 to about 34,200 visitors in 1991, a 67 percent increase.

Volta WMA experienced a sharp drop in user levels between 1987 and 1989. About 6,270 people visited the wildlife area in 1987. This dropped 38 percent to about 3,900 visitors in 1989. From 1989 until 1991, user levels have dropped slightly from 3,900 to about 3,850

From 1987 to 1989 user levels at the San Luis Reservoir WA have risen 8 percent from about 1,520 to 1,630. From 1989 to the present, user levels have dropped 28 percent to below 1987 levels, with about 1,180 visitors using the wildlife area in 1991.

The O'Neill Forebay WA has experienced a steady increase in visitors since 1987. From 1987 to 1991 user levels have risen 12 percent from about 2,820 to 3,160 people.

## RECREATION TECHNICAL MEMORANDUM

The Little Panoche WA experienced a small increase in users from 1987 to 1989. The number of visitors increased from 3,520 to about 3,570 during this period. From 1989 to 1991, user levels decreased 25 percent from about 3,570 to 2,680 people.

Since data are only available from the last year, a recreation trend cannot be determined for the recently opened North Grasslands Wildlife Area. CDFG does not currently monitor public use of the two units of the North Grasslands Wildlife Area, except for those individuals that register at other check points (Kesterson and Los Banos) to hunt waterfowl during the open season. The recorded visits for waterfowl hunting during the 1991-92 season was 44 for Salt Slough Unit and 166 for the China Island Unit. Based on employee observations throughout the year, total estimated public use for Salt Slough was about 275 persons and, for China Island Unit, about 400 persons.

Public use has been increasing at the North Grasslands Wildlife Management Area over the 1992-93 fiscal year and is expected to jump drastically with the development of wetlands on the Salt Slough Unit in the following year. According to staff, not many potential recreation users are aware that the wildlife area is open to their use and those that do are waiting for internal use roads that would provide automobile access to the areas interior (Howard, 1992).

During the 1987 to 1990 setting period, recreation use, measured in visitor hours, at the San Luis Reservoir has continuously increased, rising by almost 40 percent (Table 10-8). Recreation use at the O'Neill Forebay reservoir in the same period has increased by over 50 percent (Table 10-8).

After 1987, visitation levels at the Reclamation-owned fishing sites (Table 10-8) showed no change. The repetition of the same number of recreation days for many of the sites indicate that there may have been an error in data collection, therefore, reliable conclusions regarding recreation trends for these sites during the post-Hammer Clause phase are not possible. It is possible that the change in visitation at these sites is so small during this time period that the reported numbers may have been rounded off to a level of significance where no change is apparent (Petrinovitch, 1992c). No trends, therefore, are discernible during this time period.

7.1.3 Change Assessment for the San Luis Water District

Recreation visitation at the National Wildlife Refuges (Kesterson NWR) increased by about 130 percent between the beginning and end of the 6-year data record. The CDFG preserves (with the exception of Volta WA, which is also a CVP-serviced site) had an overall increase in visitation ranging from about 15 to 170 percent over the 18-year data record. During the two setting periods, CVP reservoirs (with the exception of the Kesterson Reservoir) had an overall increase in visitation levels, ranging from about 45 to 400 percent over the 20-year data record. The increase at the reservoirs is apparent even though there was an adjustment in the data that probably minimized the overall increase. Caution must be used in interpreting the CVP data because of the adjustment that occurred in 1981 when Reclamation began using a 12-hour standard. During this time, the data experienced a considerable drop in absolute totals. Reclamation staff believe that this drop-off was due to the adjustment in the standard, and that the actual overall trend for the data set over the 20-year time period was upward (Petrinovitch, 1992c). The CVP fishing canals experienced a decrease in visitation by about 50 to 60 percent from the beginning to the end of the 20-year data record. There is no notable trend difference, or difference in the variation in the trend line, between pre- and post-Hammer Clause implementation.

The data sets for San Luis Water District show both an increase and a decrease over the periods, with visitation at preserves and reservoirs on the rise and visitation at the fishing sites falling off. Additionally, the trends in visitation at these sites bear no similarity to those exhibited at either refuge in the control SAs.

If the RRA was the agent of change, increases in recreation at the preserves and the reservoirs in San Luis Water District could have been caused by increased supplies of water and the holding of water longer in the reservoirs (Research Question Nos. 2 and 3). Additionally, decreasing visitation at the fishing canal sites could have resulted from lower flows in the canals. This could be due to less drainage water directed into canals because of increased water conservation as a result of 1987 and 1988 RRA regulations (Research Question No. 5).

The variation from year to year at most of the sites over the entire time period of the data sets (e.g., Figure 7a, San Luis Reservoir and O'Neill Forebay from 1970 to 1990) suggests that factors other than the 1987 RRA implementation, over the long term,

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influenced annual visitation levels. These factors could be related to facility development, the raising and lowering of water levels or the reduction in recreational opportunities for operational and maintenance purposes, emergencies, etc.

The changes in recreational use levels that have occurred during the setting period may be attributed to non-RRA factors, especially the drought and increases in the background population, as discussed in Section 4 of this Technical Memorandum. Population change data in the San Luis Water District over the period from 1980 to 1990 are not available.

For further discussion of the potential linkages to the RRA and the indications that observed trends cannot be attributed to the RRA, please see the general discussions under subsection 6.1.3 for Glenn-Colusa Irrigation District.

The changes in recreation visitation for the San Luis Water District have probably been caused by a combination of factors. It is difficult to establish any definitive linkages between changes in visitation levels and the various possible causes with the available data.

### **7.2 WESTLANDS WATER DISTRICT**

There are no National Wildlife Refuges located in or near the Westlands Water District. State preserves include the Mendota Wildlife Management Area, which receives CVP water. There are no CVP reservoirs associated with the District. CVP river and canal recreation sites include: Delta Mendota Canal Site 5, Fairfax Fishing Access, Three Rocks Fishing Access, Huron Fishing Access, and Avenal Cut-Off Fishing Access.

The Mendota Wildlife Management Area is adjacent to the Westlands Water District. Both appropriative user activities (i.e., activities requiring a license) and non-appropriative user activities occur at the Mendota Wildlife Area, and facilities for those activities are maintained. Both individuals and groups use these facilities. Appropriative uses are waterfowl and pheasant hunting, fishing, and frogging. Non-appropriative uses are nature study, camping, picnicking, sightseeing, bird watching, and organized field trips or dog trials.

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These fishing access sites provide basic facilities for anglers along the CVP canal distribution system. They generally include an access road from a main road, a parking area, and a trail to the canal. The access area itself is usually enclosed to limit anglers to the designated area of recreation access on the canal.

### 7.2.1 Pre-Hammer Clause Setting (Prior to 1987)

Mendota Wildlife Management Area had decreasing user levels from 1978 until 1982, when they reached a low point of about 29,880 visitors. From 1982 to 1985 visitor levels rose 49 percent to about 44,570 visitors. After this peak in 1985, visitor levels dropped 9 percent to about 40,610 in 1987. Yearly attendance at the Mendota WMA from 1981 to 1991 is shown in Figure 10-7.

Prior to 1987, visitation at the CVP fishing sites in the Westlands Water District (as shown in Figures 10-9b and 10-9c) generally decreased. This decrease was most apparent in 1981. However, this numerical change coincides with when Reclamation began using a standard 12-hour visitor day.

### 7.2.2 Post-Hammer Clause Implementation Setting (1987 - Present)

In 1987, 40,610 people visited the Mendota WMA. From 1987 to 1989 this number dropped again, as it had in the previous few years, by 17 percent to 33,740 visitors. From 1989 till 1991 the visitation levels have continued to drop to 23,265 visitors.

The 1991-92 waterfowl hunting season brought 7,850 hunters to Mendota WMA. Hunters killed approximately 16,660 birds, for an average take of 2.05. The total number of waterfowl killed increased by 178 birds from the previous hunting season, but the total number of hunters decreased by 551.

After 1987, visitation levels at the CVP fishing sites (Table 10-8) showed no change as reported by Reclamation. The repetition of the same number of recreation days for Delta-Mendota Canal Site 5, Fairfax Fishing Access, Three Rocks Fishing Access, Huron Fishing Access and Avenal Fishing Access indicate that there may have been an error in data collection for these sites, therefore, reliable conclusions regarding recreation trends for these sites during the post-Hammer Clause phase are not possible. It is possible that the change in visitation at these sites is so small during this

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time period that the reported numbers may have been rounded off to a significant number where no change is apparent (Petrinovitch, 1992c). No trends, therefore, are discernible during this time period.

### 7.2.3 Change Assessment for the Westlands Water District

The following change in visitation levels was found in the use data for the Westlands Water District. The Mendota WMA had a 15 percent decrease in visitation from the beginning to the end of the 6-year data record. Figure 10-8 shows how the total number of recreational users at the Mendota WMA have changed in Westlands Water District since 1980. The CVP fishing canals in the WWD experienced a decrease in visitation by about 66 to 200 percent over the 20-year data record. There is no notable trend difference, or difference in the variation in the trend line, between pre- and post-Hammer Clause implementation. Caution must be used in interpreting the CVP data because of the adjustment that occurred in 1981 when Reclamation began using a 12-hour standard.

The data sets for Westlands Water District show both an increase and a decrease over the periods, with visitation at Mendota WMA and the fishing access sites decreasing.

The variation from year to year at most of the sites over the entire time period of the data sets (e.g., Figure 10-8, 10-9b, and 10-9c) suggests that other factors aside from the 1987 RRA implementation, over the long term, influence annual visitation. Population increased by about 33 percent in the Westlands Water District over the period from 1980 to 1990 (Technical Memorandum, Task 11).

For further discussion of the potential linkages to the RRA, and the indications that observed trends cannot be attributed to the RRA, please see the general discussions under subsections 6.1.3 and 7.1.3.

The changes in recreation visitation levels for the Westlands Water District have probably been caused by a combination of factors. It is difficult to establish any definitive linkages between changes in visitation levels and the various possible causes with the data that are currently available.



### 7.3 FRESNO IRRIGATION DISTRICT

There are no National Wildlife Refuges located in or near the Fresno Irrigation District. See the Westlands Water District section above for a discussion of the nearby Mendota State Wildlife Management Area. CVP reservoirs include nearby Millerton Lake.

Millerton Lake is a reservoir that, together with surrounding lands, comprises the Millerton Lake State Recreation Area. The concrete gravity Friant (Millerton) Dam was completed in 1942 on the San Joaquin River. The reservoir has a capacity of 520,000 af (Kahrl, 1978). It controls San Joaquin River flows, provides downstream releases to meet requirements above Mendota Pool, and provides conservation storage and diversion into Madera and the Friant-Kern canals (Kahrl, 1978). The Millerton Lake SRA is a highly developed facility with existing or planned facilities that includes picnic areas, swimming beaches, campgrounds, hiking and equestrian trails, boat launching facilities and marinas, excursion ferry boat service, scenic overlooks, and the historic Millerton Courthouse (Dangermond & Associates, 1992). Millerton Lake's most popular recreation activities are water-dependent. The three top 1987 report year recreation activities in terms of most participation at Millerton Lake were motorized boating, water-skiing, and camping. In 1991 Millerton Lake had 512,235 recorded recreation use visits and a total of 6,960,528 recreation use visitor hours.

Reclamation owns the site (including all lands of the State Recreation Area), however, recreation activities are managed by both the CDPR and BLM. Principal uses of the reservoir include irrigation, flood control, and recreation. The total land area at Millerton Lake is 8,175 acres, of which 1,950 acres are designated for public recreation use. The remaining 6,225 acres are undeveloped recreation lands. Millerton Lake has a 51-mile shoreline (1987) with a total water surface recreation area of 4,915 acres.

Millerton Lake also has four campgrounds with a total of 133 campsites, 11 picnic areas, 2 shelters, 1 swimming beach, 6 launch ramps, and 24 ramp lanes. Millerton Lake has one private concessionaire and a marina with 500 slips. Fees are charged for entrance, campground use, and boat launching. The most commonly caught fish in 1987 were, bass, striped bass, and catfish. There are no hunting opportunities at Millerton Lake.

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### 7.3.1 Pre-Hammer Clause Setting (Prior to 1987)

Annual recreation day totals for Millerton Lake are shown in Table 10-7 and in Figure 10-8a. During the period from 1970 to 1978, the total number of annual recreation days increased by 90 percent, rising from 574,000 until it peaked at 1,088,000 days. From the 1978 high of 1,088,000 recreation days, recreational use at Millerton fell to a 1982 low of 386,000 recreation days, a 65 percent decrease. From 1982 to 1986, annual recreation days increased by 49 percent, to 575,000 days in 1986.

### 7.3.2 Post-Hammer Clause Implementation Setting (1987 - Present)

From 1987 to 1988 there was a 5 percent increase to 852,000 annual recreation days in 1988 (Table 10-7, and Figure 10-8a). After 1988, recreational use fell by 33 percent to 570,000 annual recreation days in 1990.

### 7.3.3 Change Assessment for the Fresno Irrigation District

Overall, it appears that recreation in the district has been on a decline during the time period under investigation. At Millerton Lake recreational use has varied highly during the period for which we have data, but 1990 use levels are almost half the 1,088,000 annual visitor days the park experienced at its peak. Recreational use levels reached a high in 1978 and then a low in 1982, then peaked again in 1988. Since then use has declined again, until in 1990 recreational use levels ended up to be about 1 percent less than 1970 use levels. Figure 10-9a shows how the total number of recreational users, for the Millerton Lake, has changed from 1970 to 1990.

Caution must be used in interpreting the CVP data because of the adjustment that occurred in 1981 when Reclamation began using a 12-hour standard, as noted previously.

The data set for Millerton Lake shows both an increase and a decrease over the periods analyzed. There was, however, a 30 percent decrease in annual recreation days from 1987 to 1990.

The research questions that because of the RRA's effect on hydrology, visitation levels could either increase or decrease depending upon the linkage (Research Question

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Nos. 1, 2, 3, and 4). The hypotheses also assume that visitation levels could increase as a result of a population increase arising from increased farm subdivision (Research Question No. 5). If the RRA were the agent of change, any increases in recreation at Millerton Lake could have been influenced by increased supplies of water and the holding of water longer in the reservoir (Research Question Nos. 2 and 3).

It would be difficult to attribute these changes to the RRA regulations because, any number of factors could have played a role in the causing the changes. The variation from year to year at Millerton Lake over the entire time period of the data set (see Figure 10-9a and Table 10-8) suggests that other factors aside from the 1987 RRA implementation, over the long term, influenced annual visitation levels. These "noise" factors are identified in Section 4.0, but two issues of particular importance to the Fresno Irrigation District are population and the drought.

The Fresno Irrigation District experienced a 60 percent increase in population over the 10-year period from 1980 to 1990 (Task 11 Technical Memoranda, Social Impact, Table 11-1). This growth level is one indicator of the many social and economic changes occurring within the District. Growth of this size would be expected to increase demand and use of nearby major facilities like Millerton Lake. The decline in visitation is, therefore, perplexing, but undoubtedly unrelated to population. A possible explanation may be the high poverty rate in Fresno County (second highest in California). Additionally, the Technical Memorandum prepared on social impacts found that, based on the available data, there was no basis to conclude that the RRA regulations had an impact on population or social conditions in the Fresno Irrigation District (Task 11 Technical Memorandum, Social Impact).

Over these last six years of drought, the water level at Millerton Lake has dropped considerably, exposing unvegetated lake bottom and creating new, and often unappealing, shorelines. This evidence of the drought is very apparent at Millerton Lake, some boat launching areas have been moved across hundreds of yards of exposed lake bottom to the new shoreline. This has contributed significantly to Millerton Lake's decreased desirability as a recreational facility affecting recreation levels significantly. The impact of the drought undoubtedly masks any effects of the RRA regulations.

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The background technical memoranda for the following sections have not demonstrated any significant physical or demographic changes in the Fresno Irrigation District related to implementation of the 1987 and 1988 RRA regulations: Groundwater / Drainage, Water Quality, Land Use, Subdivisions, Social Impacts, and Economics. Because no changes were found in any of these areas, there could be no mechanism related to the RRA which would cause a significant change in recreation. However, the changes in recreational use levels that have occurred during the setting period in Fresno Irrigation District may be attributed to other factors, especially the drought, as discussed.

The changes in recreation visitation levels for the Fresno Irrigation District have probably been caused by a combination of factors. It is difficult to establish any definitive linkages between changes in visitation levels and the various possible causes with the data that is currently available. Site specific information on the profiles of recreational users is not available and the accuracy of data on user levels at Millerton Lake is not known. With the limitations of the data and the changes in population, socioeconomics, etc., occurring in the project areas, any definitive linkages between the RRA regulations and the changes in recreation visitation cannot be substantiated.

### **7.4 LOWER TULE RIVER IRRIGATION DISTRICT**

National Wildlife Refuges in the vicinity of the Lower Tule River Irrigation District include the Kern NWR and the Pixley NWR (no public access). Recreational user data were not available for Kern NWR. There are no state preserves or CVP Reclamation-owned sites located in or near the Lower Tule River Irrigation District.

### **8.0 SUMMARY AND CONCLUSION**

Trends in recreation use over the study period at the two National Wildlife Refuges associated with the Central California Irrigation District, have been inconsistent. One site (Merced NWR) has had steadily increasing visitation, and the other has exhibited high variability from year to year (e.g., San Luis NWR total visits between 1987 and 1990). Overall visitation trends at the other control sites, Sacramento and Delevan NWR's were also inconsistent. Delevan NWR has experienced a small but steady rise since a low point in 1987. The Sacramento NWR has, conversely, been experiencing year to year fluctuations which do not appear to follow any particular pattern.

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The CVP-served SAs have also exhibited these two patterns (steady increase and yearly variability resulting in general increases over time), with overall increases in site visitation being the norm at some CDFG, NWR, and Reclamation-owned sites. Some individual preserves did experience overall decreases in visits, but in total, visits at the CDFG and NWR preserves increased during the time periods studied. Notably, the trends in the SAs appear to exhibit variability from year to year. Overall, there appears to be no clear relationship between the trends and variations observed in the control districts and those of the sample agencies. The non-RRA factors discussed in Section 4.0 probably have affected recreation trends differently in each of the SAs analyzed. Population increased in most of the CVP SAs (27 percent-60 percent), as also occurred in the control SAs (about 37 percent [CCID] and 27.4 percent [OAID]). This could have been a major contributor to the increase in recreation visitation at all sites, although this is not always clearly established, as in the case of the Fresno Irrigation District. Likewise, the effects of the current and previous droughts at the recreation sites likely have had a substantial influence on total annual visitation at all water-oriented sites and its effects mask any influence of the RRA regulations.

Each of the research questions identified in Section 1.2 presents potential links between the RRA and changes in water-based recreation. These questions rely on the assumption that there was some change due to the RRA, in either the physical landscape (hydrology, water quality, crop patterns) or in issues related to demography and economics. Research questions related to the hydrologic regime included those relating to wildlife refuges and preserves (No. 1 "if increases in shallow ground water extraction due to the increased cost of CVP water negatively affected surface water supplies, thereby reducing wildlife value, did it result in reduced recreation visitation levels at the preserves?"), CVP Source Reservoirs/Lakes (No. 2 "if CVP water was retained longer in reservoirs, did recreation visitation increase?" and No. 3 "if water was held longer in canals, did visitation increase?"), and Rivers (No. 4 "if less runoff was 'wasted' to rivers, did it result in decreased recreation opportunity in those rivers?").

James M. Montgomery Engineers (JMME) have not been able to demonstrate that groundwater effects, particularly near-surface groundwater, have resulted from implementation of the 1987 and 1988 RRA regulations. Likewise, JMME's findings regarding surface hydrology indicate no changes related to the 1987 and 1988 RRA regulations. Data regarding tailwater runoff or effects of water conservation programs that might be used to evaluate Research Question Nos. 2, 3, and 4 were unavailable.

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Additionally, it was hypothesized (No. 5) that if population increases resulted from the subdivision of farms, would it have added to visitation at recreation sites? The findings of the social impact assessment (Task 11) do not suggest a linkage between the RRA regulations and population growth consistently among the SAs. A linkage to recreation is not, therefore, supported.

It appears that non-RRA factors in the SAs may have been much more influential on recreation than any effects of the RRA regulations. In most cases, data gaps make it impossible to draw any definitive conclusions about the effects of the 1987 and 1988 RRA regulations on recreation.

Overall, the analysis was unable to detect that the 1987/1988 RRA regulations caused a change in visitation levels at water-dependent recreation sites because there was no mechanism attributable to the RRA, either social or hydrologic in nature, to cause a change (Technical Memoranda, Tasks 11 and 3). Secondly, the identified changes appear to be insignificant compared to other background factors. Non-RRA factors, especially the drought and background population increases were so large as to potentially overshadow or obscure any influences of the 1987 and 1988 RRA regulations.

No definitive statements can be made regarding the extent of possible RRA regulations' effects on changes in recreational use. This is partially a result of the amount of data gathered and the methodology that could be executed in the time frame of this study. However, even with the limited data set one would expect to see some discernible trends in recreation if there had been any effects from the 1987 and 1988 RRA regulations. The fact that none of the data sets collected indicate a change related to the RRA regulations supports the hypothesis that there was no change in recreation use levels. Elements that would be useful in discerning any RRA effects should take into consideration the socio-economic profiles of recreation users broken down by type of facility used and place of origin, which would be possible only through user surveys which are unavailable. Also, a detailed, system-wide comparable, assessment of each recreation facility's development, maintenance operations, and water regime over the study period would be needed.

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